QST

october, 1946
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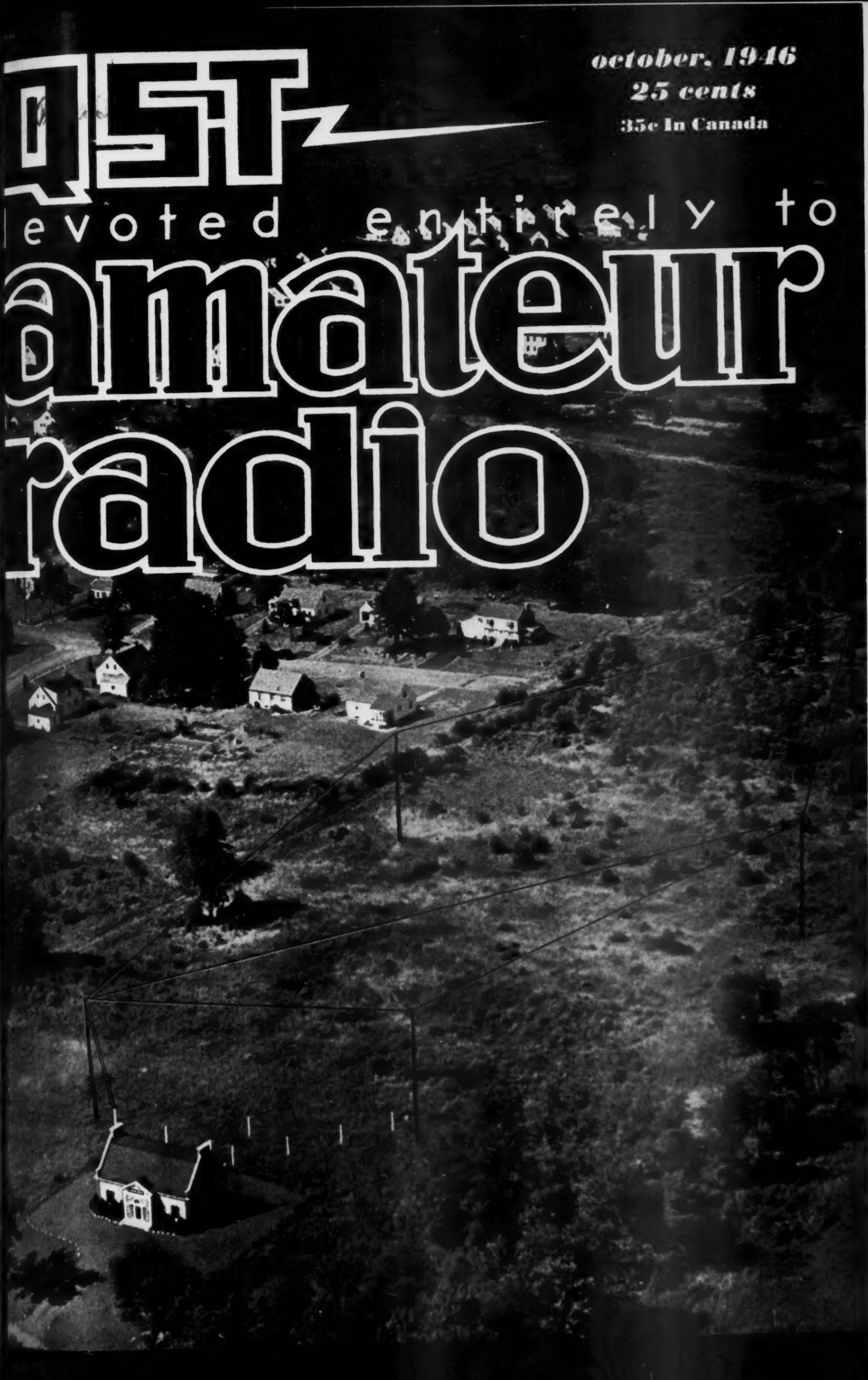
devoted entirely to

amateur radio



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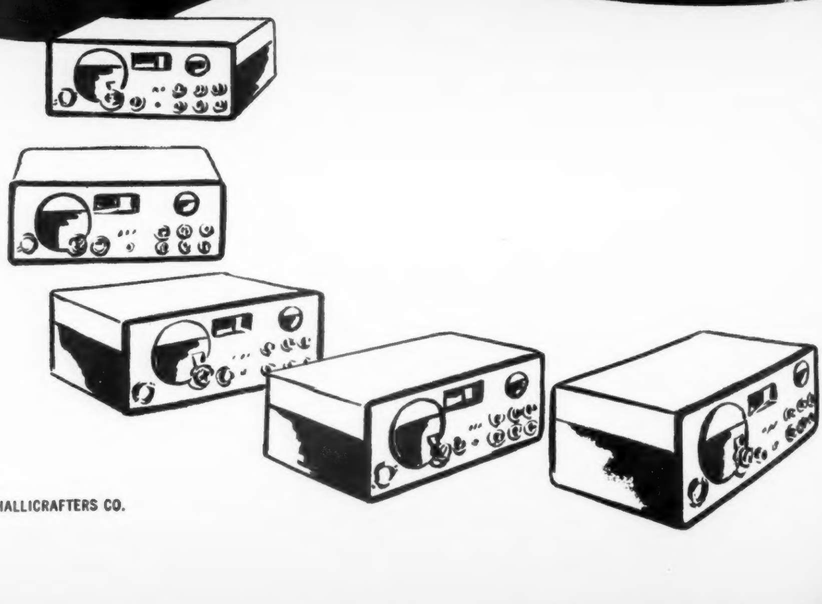
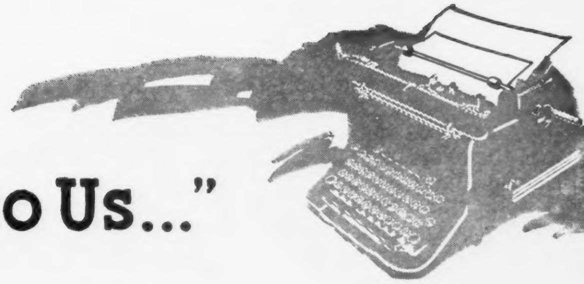


"It Seems to Us..."



COMPLEXITY

George was hopping us the other day for wasting the technical department's time every morning wailing about W1EH's technical difficulties the night before or talking over new brainstorms and asking for advice. "Dad burn it," he said, only that isn't what he said, "you're as bad as the rest of these guys. Why don't you read *QST* and the *Handbook*?"

We're all alike. Most of the Hq. gang have had as many troubles as the rest of you getting going again after the war. There's too much that we've forgotten, even about the simple things. And the literature of our art is now extensive and difficult. Very few of us seem to remember what has been published in *QST* in the past or to be willing to make the necessary search to find the answer to our problem. In planning the contents of *QST* at Hq. we sometimes think that if we republished old articles most of the gang wouldn't know the difference and that perhaps we really ought to do it to review some of the lost ground. There's too much to it for most of us to keep up with. It has been said that the number of instruments that an airplane pilot has to watch comes close to being the utter limit of what the human mind can cope with. Sometimes we feel the same way about amateur radio — that it is simply becoming too complex for the average ham, including ourself. We still seem to be geared to the early 30s when we had oscillator transmitters and two-tube receivers, and our minds have difficulty accumulating enough engineering knowledge to do the required job on present-day radio equipment. In our own lab here we can remember when we used to be able to plan, build and test a bread-board transmitter or receiver in a single day. Now we have such things as bandswitching rigs that may take an expert amateur not only weeks but months to plan, lay out, build, remove bugs, and rebuild, until he is satisfied that the design is good and duplicable — and then the wiring diagram takes the greater part of a *QST* page and the parts list reads like the specifications for a battleship. One reason why more and more manufactured equipment is being sold — a trend that we can't help deploring — is probably this fiendish increase in complexity that seems necessary to get the results we demand today.

To many of us, the "good old days" were the days when we could build all our own gear and understand what we were doing, and when we were just as well posted technically as the next ham. For each of us there is a limit, and meanwhile the requirement for complete knowledge grows higher and higher and is attainable by fewer and fewer.

Anybody any idea what we can do about it?

BUM SUPERHETS

We take for our text the opening clause of the new language in §12.152 of our regulations, about quiet hours: "If the operation of an amateur station causes general interference to the reception of transmissions from stations operating in the domestic broadcast service when receivers of good engineering design including adequate selectivity characteristics are used to receive such transmissions . . ."

There are a couple of little things that first may be pointed out. "Domestic broadcast service" is a broad term that includes f.m. and television broadcasting as well as standard a.m. And if you remember the old language about receivers of "modern design," you'll note that the expanded description of receivers entitled to consideration gives us amateurs continuing protection.

We wish we had means for informing the whole general public that when they buy cheap receivers having inadequate preselection and inadequate shielding they are not entitled to protection from interference from well-adjusted amateur stations operating in compliance with extensive regulations. They haven't done their part. We wish we had the ability to impress the set-building industry with the great desirability of confining their output to sets that are good enough to retain the goodwill of the amateur fraternity — and of the public, too, after enough time has gone by for them to realize what they've bought. Because, in our own interests, we shall have to tell them when they have a cluck. There will

probably be tough competition in the BCL-set market and the industry will be interested in every place it can save a nickel; but the public is entitled to some protection and we amateurs are entitled to some protection, and there decidedly should be a limit to how frowsy a job is put on the market. The spectrum is so crowded now, and so many categories of stations work within small geographical separation, that in our opinion, the day has passed when the uninformed public should be offered receivers so short-changed in design and materials that they are certain to encounter trouble.

The amateur does not like to cause interference to listeners and lookers-in, regardless of how poor their equipment is. He knows that some people cannot afford expensive receivers. He'll do his best to help them, and he knows from experience that a certain amount of unpleasantness, annoyance and loss of time is inescapable. But the amateur also wants to operate, and not be put upon, and not be blamed for troubles that come from skimped designs and cut corners in the set factory rather than from his transmitter. The present standard is the only possible one: to recognize that when interference comes on a BCL set of poor design, inadequate selectivity and insufficient shielding, the poor set owner is not entitled to relief and the amateur is entitled to continue operating. Receivers can be good; when the amateur generally interferes on decent sets, the fault is his and he must rectify it. The general public will be well advised if they confine their purchases to receivers that enjoy this protection.

The whole amateur fraternity would be no end grateful if the set-building industry would take these factors into account in planning its postwar wares.

HOW ABOUT F.M.?

We wonder why we fellows don't give f.m. more of a play for our short-range communications, particularly 10 meters on short skip and local work, and 6 meters. It seems to offer many advantages, yet "intentional" f.m. is still a rarity in our midst.

We have no f.m. standards yet, for lack of experience under our own conditions, but we see no point in our ever going in for the big deviation ratios used in broadcasting. Narrow-band f.m. seems much better suited to communication jobs and can be much more easily accomplished. We were interested in reading recently a wartime Army report on some comparative tests between narrow-band f.m. and amplitude-modulated 'phone. For the best response on weak signals, the best deviation ratio was found to be between 1-to-1 and 2-to-1, somewhere about 1½-to-1. It was said that this small-deviation f.m. gave fifty per cent more range (for the same signal/noise ratio) than the same power amplitude-modulated, and at its midrange gave a hundred per cent better communication as measured by intelligibility tests. We ought to find that definitely interesting. And for many of us it should offer a means to escape BCI.

It can't be the transmitters that are holding us back, for they are much simpler than a.m. jobs. It is, of course, the receiver problem. However, even the ordinary a.m. superhet will deal quite well with these small-deviation f.m. signals. It seems to us we'd find it profitable to make a beginning on that basis, and we commend the idea to those looking for improved results.

And now we wonder why we started out talking just 10 meters and 6. Narrow-band f.m. would definitely have the aspects of a blessing on 2 meters because, properly done, it would occupy vastly less spectrum space than the average modulated-oscillator signal and would be receivable in good quality on narrow-band superhet receivers and on converters feeding communications receivers, something true today only of the carefully-stabilized a.m. signal. The problems, of course, are a great deal more severe, requiring a more stable oscillator (percentagewise) in the receiver and less drift in the transmitter than we are accustomed to. In fact, we're not at all sure small-deviation f.m. is the best answer for 2 meters. The kind of f.m. that the police service calls narrow-band may be a better solution. But we do think that the effort to find the right application for this band will prove as much worth while as on 10 and 6.

How about it, fellows?

OUR COVER

We present an aerial eyeful of that ethereal earful, W1AW, ARRL headquarters station, shot by Staff Photographer Frank Beaudin while flying at 600 feet. To the rear of the W1AW building are the five 65-foot antenna poles and the feed-line supports. The station occupies a 7-acre site at Newington, Conn., 4 miles from Hq.

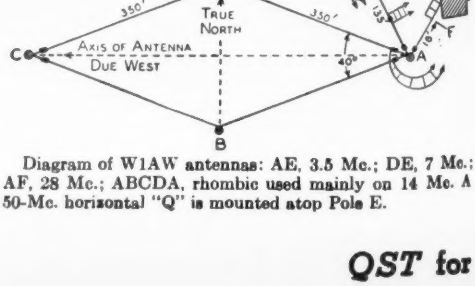


Diagram of W1AW antennas: AE, 3.5 Mc.; DE, 7 Mc.; AF, 28 Mc.; ABCDA, rhombic used mainly on 14 Mc. A 50-Mc. horizontal "Q" is mounted atop Pole E.

A Medium-Power Bandswitching Transmitter

Four Bands with a 4-125A Tetrode Output Stage

BY RICHARD M. SMITH,* W1FTX

• The work that goes into a bandswitching transmitter pays large dividends in operating convenience. Further, if some thought is given to reliability in the circuit design, the rig will be trouble-free as well as easy to operate. Here's a transmitter that combines bandswitching, reliability and fairly large power output, with the ability to operate with plate modulation as well as on c.w.

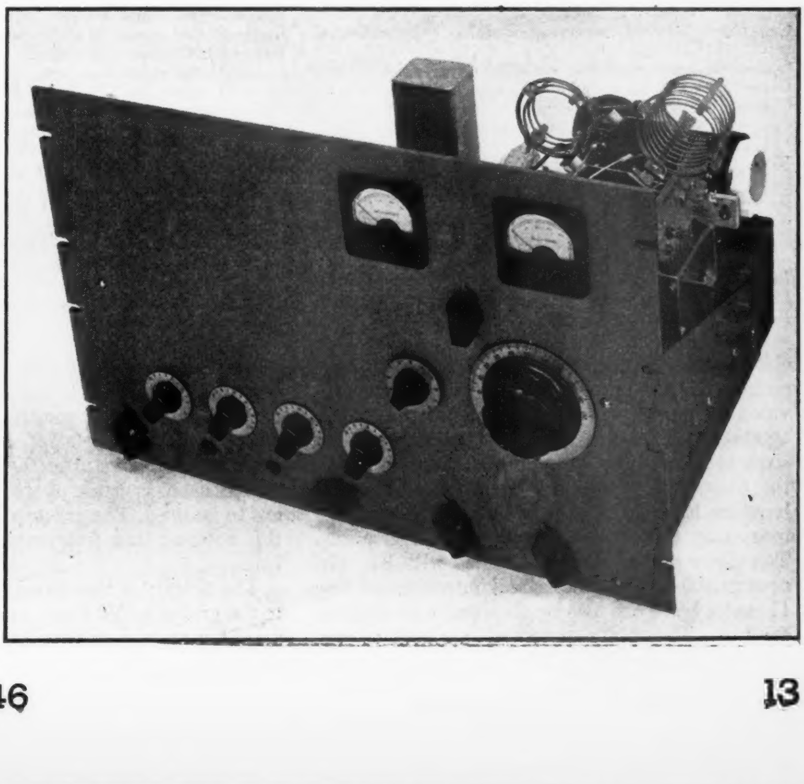
For operating convenience nothing can compete with a bandswitching transmitter. Anyone who has ever used one will back this statement to the limit, and for those who have never been able to change from one band to another without tearing half of the station apart, a new experience is in store. Gone are bothersome plug-in coils, the risk of grabbing a "hot" tank coil when changing bands, the need for crawling behind a rack, and the reluctance to move from one band to another. The time saved by bandswitching is worth a lot of points in any operating contest, and can mean the difference between catching some of that elusive DX and being left at the post.

* Technical Assistant, *QST*.

The transmitter illustrated combines complete bandswitching from 80 meters through 10 meters with moderately high power — a feature that is usually lacking in most bandswitching rigs. A 4-125A beam tetrode is used in the output stage, driven by frequency-multiplying stages which, because of the low driving-power requirements of the final, can loaf along at considerably below ratings. This adds to the reliability of the set because tube failures and other breakdowns are reduced to absolute minimum. The final can be operated at 375-watts input for c.w. operation, or 270 watts in 'phone service.

The Circuits

The circuits are straightforward as shown in Fig. 1, and include no special tricks. A Pierce crystal oscillator is used, operated at low plate voltage to permit maximum frequency stability. No effort is made to use the oscillator as a power generator, and as a result it keys well without



Front view of the bandswitching transmitter. The controls along the bottom of the panel are, left to right, the crystal selector switch, oscillator key jack, final key jack, low-power stage bandswitch, plate-meter switch and grid-meter switch. Above, in the same order, are the tuning controls for the 6V6, the two sections of the 6N7, and the 807 plate. The 270-degree knob to the left of the main tuning dial is the excitation control. The knob just below the meters controls bandswitching in the output stage. The plate meter is on the left, the grid meter on the right.

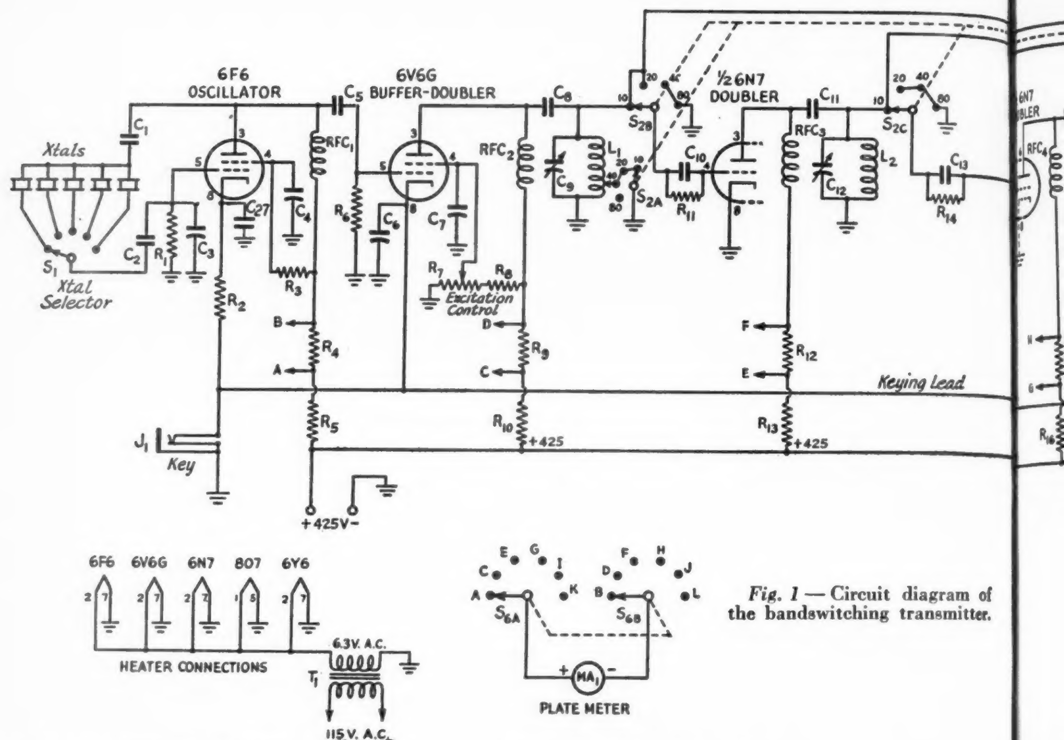
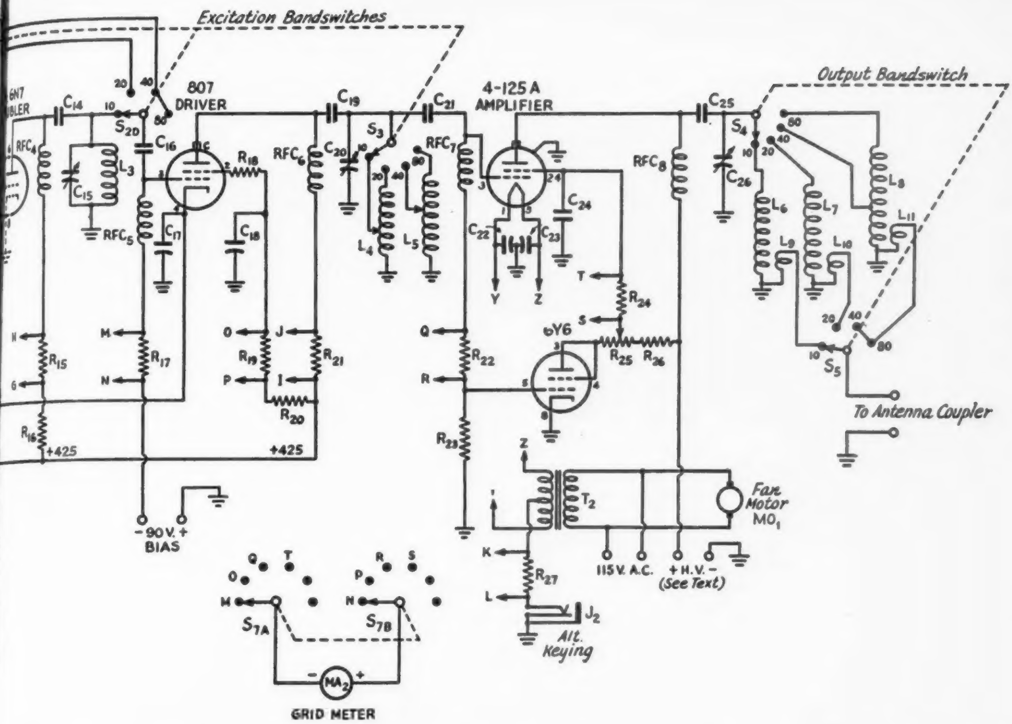


Fig. 1 — Circuit diagram of the bandswitching transmitter.

C_1, C_2, C_{16}, C_{19} — .001-μfd. mica.
C_4, C_6, C_7, C_{17}, C_{18}, C_{22}, C_{23}, C_{27} — 0.01-μfd. 600-volt paper.
C_5, C_8, C_{21} — 150-μμfd. mica.
C_9 — 140-μμfd. receiving variable (Hammarlund MC-140-S).
C_3, C_{10}, C_{13} — 100-μμfd. mica.
C_{11}, C_{14} — 0.002-μfd. mica.
C_{12}, C_{15} — 50-μμfd. receiving variable (Hammarlund MC-50-S).
C_{20} — 100-μμfd. receiving variable (National ST-100).
C_{24} — 220-μμfd. mica, 5000 volts d.c. working.
C_{25} — 0.001-μfd., 5000-volt mica.
C_{26} — 120-μμfd. variable, 0.10-in. air gap (Cardwell XE-120-XS).
R_1 — 47,000 ohms, ½ watt.
R_2 — 1000 ohms, ½ watt.
R_3 — 68,000 ohms, ½ watt.
R_4, R_9, R_{12}, R_{15}, R_{17}, R_{19}, R_{22}, R_{24} — 22 ohms, ½ watt.
R_5 — 50,000 ohms, 3 watts (three 0.15-megohm 1-watt units in parallel).
R_6 — 0.1 megohm, ½ watt.
R_7 — 75,000-ohm wire-wound potentiometer.
R_8 — 50,000 ohms, 10 watts.
R_{10} — 15,000 ohms, 10 watts.
R_{11}, R_{14} — 22,000 ohms, ½ watt.
R_{13} — 7500 ohms, 10 watts.
R_{16} — 5000 ohms, 10 watts.
R_{18} — 68 ohms, ½ watt.
R_{20} — 30,000 ohms, 10 watts.
R_{21} — Meter shunt; see text.
R_{23} — 20,000 ohms, 5 watts.
R_{25} — 50,000 ohms, 50 watts, with slider.
R_{26} — 50,000 ohms, 50 watts.
R_{27} — Meter shunt; see text.
L_1 — 31 turns No. 22 d.s.c., 12½ turns ½-inch long between ground end and tap; 18½ turns closewound between tap and plate end. Wound on 1-inch diam. form (Millen 45000).
L_2 — 11 turns No. 22 d.s.c. 1 inch long on 1-inch diam. form (Millen 45000).
L_3 — 4 turns No. 20 d.s.c. 1 inch long on 1-inch diam. form (Millen 45000).
L_4 — 7 turns No. 18 bare, 1$\frac{3}{16}$-inch diam., 1⅜ inches long, tapped 3 turns from ground end. (National AR-16-10E with link and 1 turn of coil removed. Link connection on plug-in base used to bring out tap.)

chirps and will not drift when left on for long periods of time. Five of the crystal sockets provided are of the type that accommodate the new crystals with ½-inch spacing between pins. The sixth is a six-prong ceramic socket for use with the older-type crystal holders that most of us have on hand from prewar days. This arrangement may be modified to suit individual needs. Ten-meter output can be obtained with 80-, 40-, or even 160-meter crystals, and output in our new 11-meter band can also be obtained with suitable crystals. The plate potential applied to the crystal tube is about 125 volts, which permits crystals of several different degrees of activity to be used with equal success. With some of the newer crystals it was found that plate voltage could be dropped still further, but 125 volts is required if old crystals of somewhat less activity are to be used. The crystals do not heat at all at this voltage, thus frequency drift is not a problem.

The output of the crystal oscillator is coupled to the grid of a 6V6 which acts as either a straight amplifier or as a doubler stage, depending upon



L_5 — 35 turns No. 20 d.s.c., 16 turns ⅞-inch long between ground end and tap, 19 turns close-wound between tap and plate end. Wound on 1¼-inch diam. ceramic form (National XR-16).

L_6 — 2¾ turns No. 14 bare tinned, 2-inch diam., 2 inches long, air wound (B & W 10-BEL with 3¼ turns removed).

L_7 — 8 turns No. 14 bare tinned, 2-inch diam., 2 inches long (B & W 20-BEL with 2 turns removed).

L_8 — 26 turns No. 14 enam. tapped 15 turns from plate end, 3½ inches long, 2½-inch diam. ceramic form (National XR-10A).

L_9 — 2 turns No. 14 bare tinned, 2½-inch diam., wound over ground end of L_6 and spaced ¼ inch from it. (Part of B & W 10-BEL assembly.)

L_{10} — 2 turns No. 14 bare tinned, 2⅜-inch diam. wound over ground end of L_7 and spaced ¼ inch from it. (Part of B & W 20-BEL assembly.)

L_{11} — 4 turns No. 14 bare tinned, wound over ground end of L_8 and insulated from it by spaghetti tubing.

J_1, J_2 — Closed-circuit jack.

MA_1, MA_2 — 0-50 ma., 2-inch-square case.

MO_1 — Fan-and-motor assembly (Barber-Colman Type Yab 569-1, with Type Yab 355-2 2½-inch fan).

RFC_1 to RFC_7, inc. — 2.5-mh. r.f. choke (Millen 34102).

RFC_8 — 2.5-mh. 500-ma. r.f. choke (Hammarlund CH-500).

S_1 — 5-position single-pole ceramic switch (Centralab 2501).

S_2 — 4-section single-pole 4-position ceramic switch (Mallory 164-C).

S_3 — Single-section single-pole 4-position ceramic switch (Mallory 161-C).

S_4, S_5 — Single-pole 4-position ceramic switch, heavy-duty contacts (Ohmite T-504).

S_6, S_7 — Two-section double-pole 6-position ceramic (Centralab 2511).

T_1 — Filament transformer, 6.3 volts, 4 amp. (Stancor P-4019).

T_2 — Filament transformer, 5 volts, 10 amp. (Stancor P-6135).

the fundamental frequency of the crystal and the position of the bandswitch. The plate tank coil for this stage is tapped, with the entire coil being used when the bandswitch is set for 80-meter output, and only a portion of it when output at higher frequencies is desired.

Plate voltage for the 6V6 is reduced to approximately 360 by dropping resistor R_{10}. The screen voltage of the tube is made adjustable by means of a 75,000-ohm wire-wound potentiometer, the excitation control, which, with the usual dropping resistor, forms a voltage divider across the plate supply. By changing the screen voltage, the output of the tube is adjusted to whatever level is required for adequate drive to the 4-125A.

When the bandswitch is set in either the 80- or 40-meter positions, the output of the 6V6 is fed to the grid of the 807. For 20- and 10-meter operation, the output of the 6V6 is switched to the grid of the first section of the 6N7 frequency multiplier. The 6N7 stages are arranged so that the grid not in use is grounded. For 20-meter operation only the first section of the 6N7 is used while for 10-meter operation both sections are

used, operating as doublers from the 40-meter output of the 6V6.

The 807 operates straight through on all frequencies. Because low plate voltage is used the plate-tank components can be kept small, a receiving-type tuning condenser being used with no danger of breakdown. The 80- and 40-meter ranges are covered by one coil, wound on a ceramic form and housed in a shield can above deck. The 20- and 10-meter ranges are covered by an air-wound coil, the plug-in type being used solely to permit removal of the 807 tube from its socket. Bandswitching in the 807 stage is accomplished by a ceramic switch similar in construction and contact arrangement to the multiple-section switch used in the earlier stages, and ganged to it through a right-angle drive mechanism. The screen circuit of the 807 includes a parasitic-suppressing resistor, R_{18}, inserted ahead of the usual screen by-pass condenser. No instability was experienced in the 807 stage with this arrangement, but in some instances it may be necessary to add a small grid choke as described in previous *QST* articles.[1] Bias for the 807 is obtained from two series-connected 45-volt Mini-Max batteries which are held to the side of the chassis by a thin metal strap. Since the grid current is small the battery life should be adequate, but if larger batteries are desired, they can be placed externally. Ninety volts of bias is not actually needed to cut off the plate and screen currents in the event of excitation failure, but is used because in some instances the grid current would be excessive if less bias was employed.

With about 425 volts on the plate and 325 on the screen, the 807 delivers more than enough drive for the 4-125A final on all bands. In operation, the excitation is adjusted by means of the potentiometer in the 6V6 stage. While the 807 screen voltage is higher than is customary, the manufacturer's rating for screen dissipation is not exceeded, even when the plate circuit is unloaded. If the grid drive becomes too high, the screen current through the 30,000-ohm dropping resistor is sufficient to drop the screen voltage to a very low value.

The circuit of the 4-125A final amplifier is designed to permit plate-and-screen modulation of the tube if 'phone operation is desired. Hence, a screen dropping resistor is used to furnish screen voltage from the plate supply. To stay within the manufacturer's ratings it is necessary to drop the screen voltage to 350 or 400 from whatever potential is used on the plate. This calls for a pretty husky dropping resistor. Space limitations would not permit mounting a single 100-watt resistor inside the chassis, so two 50-watt units were mounted side by side and connected in series to obtain the required 100-watt rating.

[1] Mix, "Unstable Signals," *QST*, August, 1946.

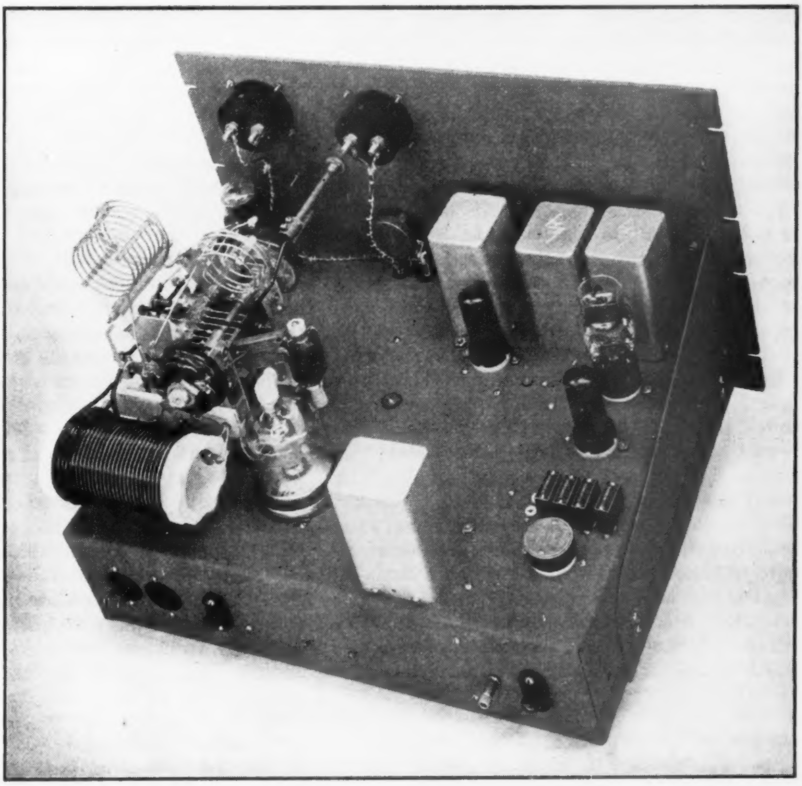
Operating bias for the final is obtained by means of a grid resistor, no fixed bias being required. To keep the screen voltage from soaring to the full plate-supply value under key-up conditions or in the event of excitation failure, a 6Y6 tube is used as a protective device. As shown in Fig. 1, the 6Y6 is triode-connected, with its plate connected to the screen end of the screen dropping resistor, and its grid connected to the grid side of the grid leak for the 4-125A. When excitation is present, about 200 volts of bias is applied to the grid of the 6Y6 from the *IR* drop across the grid resistor — more than enough to keep the tube nonconductive. However, when the key is up, excitation is removed, and the 6Y6 grid is without bias. Thus it draws plate current through the screen dropping resistance. The current drawn, in the neighborhood of 20 or 30 ma., is sufficient to reduce the screen voltage on the 4-125A to a very low value. As a result, the final plate current falls to 8 or 10 ma. — much better than relatively enormous amounts of fixed bias could do under similar conditions.

Three coils are used in the plate circuit of the final. The first, wound on a ceramic form, is used for 80- and 40-meter operation. Commercial air-wound coils with the plug strips removed are used in the 20- and 10-meter tanks. Bandswitching in the final amplifier is accomplished by a pair of ganged single-pole four-position switches of the heavy-duty type. One switch connects the desired coil to the plate tuning condenser while the other switches the ungrounded ends of the output links. Particular care should be taken to insure good insulation in mounting both switches because the r.f. potentials encountered are very high, especially when the final is unloaded during tune-up.

The use of fixed links for output coupling, a mechanical necessity, requires that an antenna tuning unit having a variable link be employed for proper adjustment of loading. A unit of the type described in recent editions of *The Radio Amateur's Handbook* will be suitable.

Metering & Keying

The meter-switching is straightforward, with 22-ohm ½-watt resistors used in the circuits to be metered. The meters are switched across these resistors by double-pole ceramic switches. Both meters are 0–50 ma. range, additional shunts being used to extend the ranges to 100 ma. for the 807 plate circuit and to 500 ma. for the 4-125A cathode. The shunts and the 22-ohm resistors are mounted on the switch contacts. The shunt for the 807 stage is wound with resistance wire, but if this type of wire is not available a suitable length of No. 30 insulated wire may be used. A short length of the latter is all that is required for the shunt for the 4-125A. The metering circuits are arranged as follows:



Rear view of the transmitter showing placement of parts mounted above the chassis. Adequate space for the later addition of a VFO unit is available in the center of the chassis.

TABLE I

PLATE METER		
Position	*Circuit Read*	*Scale*
AB	6F6 plate and screen	50 ma.
CD	6V6 plate and screen	50 ma.
EF	6N7 plate (20 meters)	50 ma.
GH	6N7 plate (10 meters)	50 ma.
IJ	807 plate	100 ma.
KL	4-125A cathode	500 ma.
GRID METER		
Position	*Circuit Read*	*Scale*
MN	807 control grid	50 ma.
OP	807 screen	50 ma.
QR	4-125A control grid	50 ma.
ST	4-125A screen	50 ma.

This arrangement may be modified to suit the individual operator's taste, but by having plate circuits covered by one switch and grid and screen currents by the other, the plate current in one stage can be observed by one meter while the grid or screen current of the same stage or the following stage can be observed simultaneously on the other.

Two keying jacks are provided, one permitting simultaneous keying of the oscillator, the 6V6, and the 807 for break-in operation, the other for cathode keying of the final amplifier. Keying the oscillator should result in clean signals if the crystal is active and a stable oscillator. Keying the final will give a slightly better keying characteristic, but without the break-in feature.

Construction

The physical layout of the rig is shown in the photographs. The entire transmitter is built on a standard 17 × 13 × 4-inch steel chassis, with a 19 × 12¼-inch Masonite panel to permit rack mounting. While maximum use of the below-chassis space is required, there is enough space left above deck and on the front panel to permit the subsequent addition of a VFO unit if desired. In fact, the layout was planned with this in mind. Space was left on the panel for a National Type ACN dial, and clearance was provided between two of the coil shields for a shaft to tune the VFO.

The tube line-up, shown in the top view, has the 6F6 Pierce oscillator located about half-way back along the right-hand chassis edge, the 6V6 buffer-doubler immediately in front of the oscillator, the 6N7 frequency multiplier to the left of the 6V6, the 4-125A final in the left foreground, and the 6Y6 screen-protecting tube in the corner,

near the front panel. The 807 driver stage, mounted below the chassis, is visible in the bottom view of the unit. The bottom view also shows the arrangement of the bandswitching system used for the low-power stages. A four-section ceramic switch is ganged to a similar single-section switch through a Millen right-angle drive mechanism.

The two ceramic switches at the lower left in the bottom view are for switching the meters. The small fan near the submounted socket for the 4-125A serves the dual purpose of cooling the final-amplifier tube base seals and the screen dropping resistors. The 807 driver is mounted parallel to the chassis surface in a Millen shield-and-socket assembly to prevent feed-back from plate to grid, and a second shield plate runs from the 807 socket to the rear wall of the chassis to prevent stray coupling from the 807 plate circuits to the oscillator and doubler circuits. The crystal selector switch is mounted on a bracket bolted to the right-hand chassis edge, close to the oscillator tube and crystal sockets. The terminal board mounted near the meter switches holds all the plate and screen dropping resistors. The filament transformers and bias batteries are mounted near the left-hand edge of the chassis where they too, obtain some benefit from the ventilating fan. Tuning condensers for the 6V6 and the 6N7 stages are mounted along the front edge of the chassis, while the tuning condenser for the 807 plate circuit is mounted near the rear, between the 807 plate cap and the grid connection of the 4-125A. The shaft for this condenser is brought out to the front panel at an angle by means of two National couplings of the "universal joint" type.

Plate voltage for the low-power stages is brought in through a Millen safety connector mounted on the rear chassis wall near the shield partition. The high voltage is brought in through a similar connector near the 4-125A and its screen dropping resistors. Power for the filament transformers and the fan is supplied through a male connector mounted on the left side of the rear chassis wall, with a female connector wired in parallel mounted alongside to permit the 115-volt source to be transferred elsewhere if desired.

All of the coils in the low-power stages, except that used for the 20- and 10-meter ranges in the 807 stage, are mounted above deck in National Type RO shield cans. The location of the three coils and the output links used in the final amplifier is shown in the photographs.

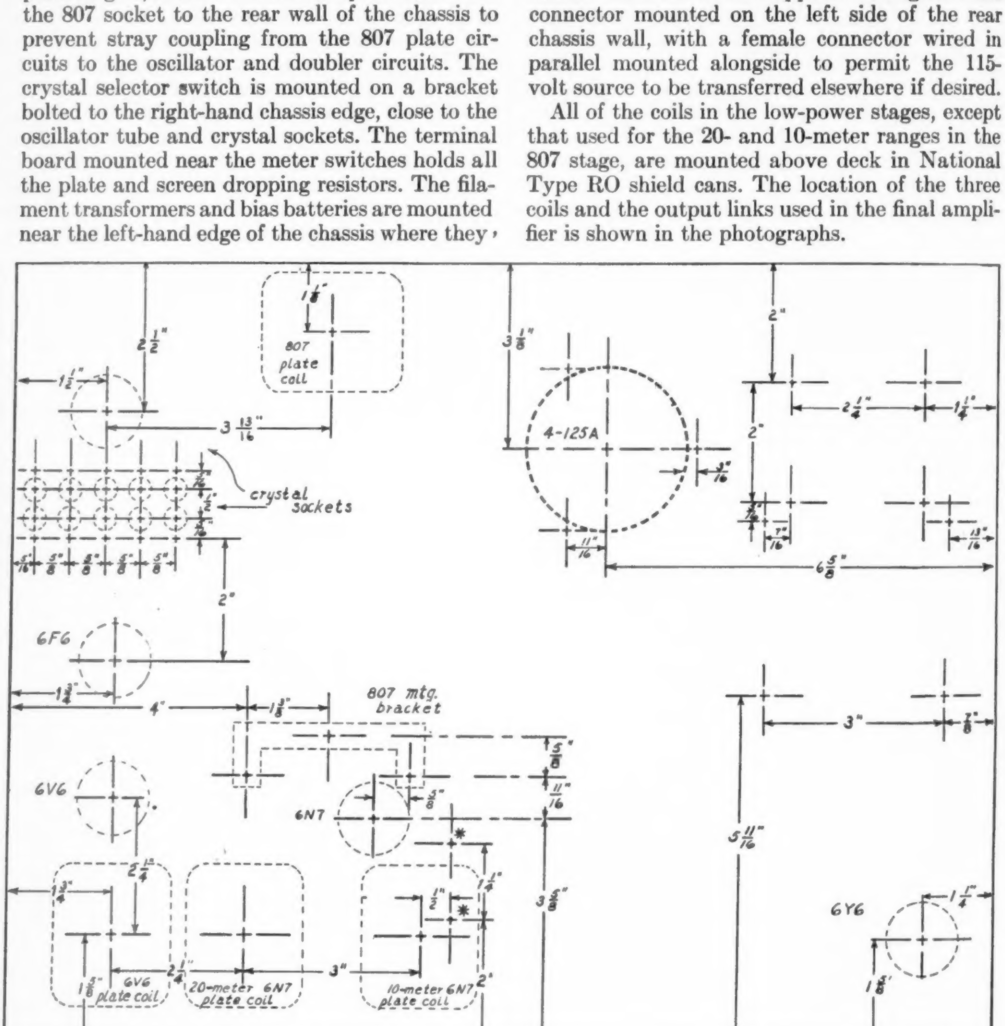


Fig. 2 — **Layout of the top surface of the chassis. The holes marked with an asterisk are for mounting the right-angle drive. Others, which are included for the convenience of the constructor, are less critical and may be rearranged slightly to suit individual needs.**

The most important mechanical consideration in building the transmitter is the proper location and ganging of the bandswitches for the low-power stages. The usefulness of the rig will be greatly impaired if the switching system becomes balky or develops slippage. Thus any amount of time spent in properly mounting the switches, and the right-angle drive shaft which connects them, is worth while.

Fig. 2 shows the location of the more important holes to be drilled in the chassis. The holes marked with an asterisk are those involved in mounting the right-angle drive mechanism, and are critical. The others are less critical and are included only to serve as a guide in construction.

Drill the holes for the posts which support the right-angle drive first. These posts are supplied by the manufacturer, and can be removed to facilitate mounting by releasing the Allen set-screws. Extreme care should be taken to insure that the holes drilled for the posts are lined up at exactly right angles to the front edge of the chassis, otherwise the entire switching system will be askew. After the holes are drilled, insert the posts, tighten them so that they are firm, and slide the drive mechanism on them with the U-shaped opening pointing in the direction shown in the bottom view of the chassis.

When certain that the posts are placed correctly and that the gear box will slide on them with ease, remove the two short shafts that hold the bevel gears inside the frame of the drive unit. Replace one of these shafts with a 9¾-inch length of ¼-inch brass or aluminum shafting. This piece is to be the main drive shaft which runs through the front panel, through the right-angle drive assembly, to the single-section bandswitch S_1, which is to be mounted at the rear of the chassis, near the 807. The other shaft is replaced by the shaft of the four-section bandswitch, S_2. Saw off all but ⅞ inch of this shaft, measuring from the point where the shaft enters the bushing on the front of the switch. Insert it in the drive mechanism and replace the gear so that it meshes with the gear on the other shaft of the drive.

The rear of the four-section bandswitch should be supported by a bracket made of ⅛-inch aluminum. The dimensions of this bracket are shown in Fig. 3. The rear section of the bandswitch is held ⅜ inch away from the bracket by ¼-inch spacers plus a couple of fiber washers. The mounting holes for the bracket can be located after the switch-and-drive assembly is placed in position.

The single-section bandswitch used in conjunction with the 807 stage is supported from the rear as shown in the bottom view. These holes can be lined up by coupling the switch to the drive mechanism and seeing where the mounting screws strike the chassis edge. The rear of the ceramic switch wafer should be held about 1⅛ inch from the chassis wall by small metal spacers.

After the low-power stages' bandswitching system is installed and operating satisfactorily, the mounting holes can be drilled for the other parts to be located below deck. The location of these parts is not critical, and can be determined from the photographs.

The fan motor is mounted on one of the brackets supplied with the new Millen 807-tube shield-and-bracket assembly. The bracket itself is bolted to the chassis with screws which pass through small rubber grommets. This mounting, which reduces the amount of vibration transferred to the chassis, will be a necessity if the addition of a VFO to this transmitter is contemplated. Incidentally, a bottom plate for the chassis, with a few ventilating holes drilled near the rear of the fan motor, should be used to insure maximum effectiveness of the fan. Considerable heat is generated within the transmitter, and care must be taken to insure an adequate flow of air around the tube base to avoid cracking the seals.

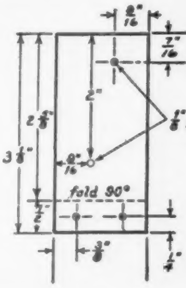


Fig. 3 — Dimensions of the angle bracket used to support the rear of the four-section bandswitch.

The socket for the 4-125A is mounted below the chassis on ½-inch spacers. Small spring contacts, made from shim stock or thin phosphor-bronze and formed to contact the grounding ring on the base of the tube, are fastened under the screws that hold the socket in place. The tube itself is inserted in the socket through a 2¾-inch hole in the chassis. This arrangement provides the necessary shielding between plate and grid circuits to prevent oscillation.

The final tank assembly is constructed as a single unit, removable from the chassis, and built entirely on the framework of the tuning condenser. The 80- and 40-meter coil form is mounted on the rear frame of the condenser. Tapped holes are already located in just the right position to permit the ceramic bar supplied with the coil form to be mounted on the condenser bracket, held away from the frame by ½-inch spacers. The 20- and 10-meter coils are mounted on Y-shaped brackets made of $\frac{1}{16}$-inch aluminum, and are positioned so that the link end of the coil will be nearest the front panel. The brackets are bolted to the frame of the tuning condenser. The two Ohmite heavy-duty switches are supported by small angle brackets bolted to upright pieces of polystyrene. The polystyrene uprights are in turn bolted to the tabs at the ends of the condenser frame. The shafts of the switches are joined by a

bakelite rod and two rigid shaft couplings. An insulated connection is required to avoid the possibility of flashover through the switch shafts to the grounded output-link connections on the link switch.

Connection of the switch shafts to the knob on the front panel may be through a ¼-inch brass rod if the panel is Masonite, but if a steel panel is used an insulated shaft will be required. The switches are coupled to the shaft by fitting a small metal tab into the slot in the rear of the ceramic bushing which surrounds the rear of the switch arm. This tab fits into a similar slot sawed in the end of the shaft running to the front panel.

The entire tuning-condenser-and-tank-coil assembly is supported by two U-shaped brackets which need only be high enough to permit the rotor plates of the condenser, when swung open, to clear the chassis surface by a fraction of an inch. Since the condenser rotor is grounded, there is no danger of voltage breakdown at this point.

The output connectors are banana jacks mounted on a 2 × 3¾-inch piece of polystyrene which replaces one of the two Mycalex bars on the tuning condenser. The centers of the jacks are spaced ¾ inch to fit a standard banana-plug assembly.

Wiring

The winding specifications for the coils used in the low-power stages are given in Fig. 1. These coils should be wound and mounted before any of the wiring around the bandswitch is started, otherwise the coil leads will be inaccessible. Slight modification of the National coil used for the 20- and 10-meter plate coil in the 807 stage, and of the B & W coils used in the final tank assembly, is required as indicated in the table. The coil forms used in the 6V6 and 6N7 stages are mounted about ½ inch above the chassis by small spacers. The ceramic form used in the 80- and 40-meter coil for the 807 is held away from the chassis by small angle brackets. Where it is necessary to run leads from the coils through the chassis, Millen ceramic bushings are used. Note that in winding the coil for the 6V6, and the 80- and 40-meter coil for the 807, the portion of the winding that is to be used for the 40-meter band is wound with spaced turns, while the 80-meter portion of these coils is close-wound. This arrangement produces a coil which has a fairly high Q in both bands, while if both parts of the coil are close-wound the Q on 80 meters will be satisfactory, but that on 40 will be much lower.

Besides the usual cautions concerning short leads and good soldered connections, a few points should be observed before the wiring is begun. Wiring will be simplified if the bandswitch assembly is removed temporarily while the connections around the sockets are made. Some of the wiring on the bandswitch itself can be done while the switch is out of the chassis. By marking the sections of the switch and the various positions of the switches on the wafers, considerable confusion can be avoided. In cases where it is necessary for wires in the bandswitch assembly to cross, a ceramic sleeve obtained by cutting the metal away from a Millen bushing is slipped over one of the wires and held in place by a drop of solder at each end. All wiring in the bandswitch assembly is done with No. 16 bare tinned wire.

The connections to the dropping resistors mounted on the terminal board near the meter switches should be arranged so the common B+ lead is nearest the chassis edge. This permits test prods to be applied to the more-accessible ends of the dropping resistors when voltage measurements are made in testing the unit.

So far as possible, d.c. leads should be cabled and color-coded to make a neater appearance and to save time should trouble-shooting be needed later.

A ¾-inch ceramic feed-through bushing is used to carry the high-voltage lead through the chassis to the plate connection of the final tube. The junction of the two screen dropping resistors is mounted on this bushing with a National GS-10 stand-off insulator to prevent shorting. The other ends of the screen resistors are supported by two more of these stand-offs from the rear chassis wall.

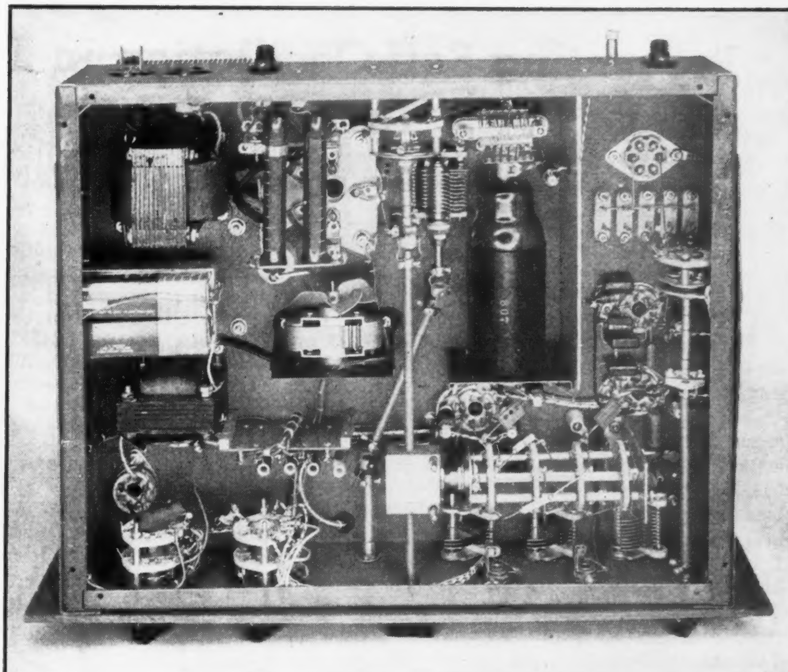
Power Supply Requirements

The low-power stages can be operated from a single supply capable of delivering 400–450 volts at 150 ma. The final amplifier was designed for use with 1800 to 2000 volts on its plate, but as much as 2500 volts can be used if only c.w. operation is planned. If it is desired to run the final in 'phone service at more than 2000 volts, a tuning condenser with wider spacing between plates will be required. It should also be noted that the 807 stage was designed for operation at no more than 450 volts, as this is more than enough to secure the output required to drive the final. If operation at higher voltage is planned, a larger tuning condenser will be required in this stage.

Adjustment & Operation

After checking the wiring carefully, power may be applied to the low-power stages of the transmitter. Turn the excitation control to maximum and set both bandswitches to the 10-meter position, one meter switch to the position which reads plate-and-screen current in the 6V6 stage, and the other to read grid current in the 4-125A. Tune the 6V6 plate circuit to resonance as indicated by a slight dip in the meter reading. Turn the meter switch to read plate current in the 20-meter section of the 6N7. The dip in plate current as this stage is tuned to resonance should be pronounced. A similar procedure is followed in tuning the 10-meter section of the 6N7. Plate current in this

Bottom view of the chassis showing location of parts and wiring. The crystal selector switch and the sockets for the 6F6 oscillator and the 6V6 buffer-doubler are on the right. The 6N7 socket is visible between the four-section band-switch and the 807 mounting bracket. The 6Y6 protective tube, the meter switches and the terminal board for the plate- and screen-dropping resistors are in the lower left-hand corner.



stage will be considerably higher than in the 20-meter section. The dip in plate current as the 807 plate circuit is resonated should also be pronounced, dropping from about 80 or 90 ma. to 30 or 40 at resonance. Grid current to the final stage should be measured at this time. If everything is as it should be, there should be at least 10 ma. of grid current. If more than 10 ma. is indicated, back off the setting of the excitation control until it falls to 10 ma. The control exerted by this potentiometer is not linear, and it may be found that there is little or no change in grid current over a considerable portion of the adjustment; in fact, the grid current may increase somewhat at first as the control is backed off. This is an indication that the drive to the 807 grid is excessive, causing its screen current to rise higher than normal, and reducing the output of that stage.

Once the low-power stages have been adjusted to give the rated amount of grid drive to the 4-125A, plate voltage may be applied to the final. When tuning up, reduced plate voltage is advisable to prevent the tube from being damaged should the final tank coil fail to resonate. A dummy load — a 200-watt lamp bulb, for example — should be connected to the output terminals of the transmitter before plate voltage is applied to the final. This is a "must," since the screen dropping resistance must be adjusted to provide rated screen voltage with the final loaded. Adjustment under any other condition will be useless. Tune the final tank circuit to resonance. The plate current at this time, with the load coupled to the final, should not exceed 150 ma. It should be remembered that the meter reads both plate and screen current, so the screen current, which can be read on the other meter, must be subtracted from the indicated value to get the true plate current.

If plate current is too high the probable reason is excessive screen voltage. The slider on the screen dropping resistor should be adjusted to apply 350 volts to the screen when the tube is operating at full plate voltage, with rated grid drive, and working at full load. Be sure to remove the plate voltage from the final before adjusting the resistor! If the plate current is excessive after the screen voltage is set at the right value, decrease the loading on the final, remembering that with a change in loading the screen current changes and therefore the screen voltage will have to be readjusted. This is one of the penalties that has to be paid for the otherwise convenient use of a screen dropping resistor.

Under normal operating conditions, the plate of the 4-125A should show just a faint blush when operating in the 10-meter band with 2000 volts at rated plate current. Too much screen voltage will result in excessive plate current and consequent overheating of the plate. Too much grid drive will cause a sharp drop in output because the screen current increases with grid excitation, in turn reducing the screen voltage. Optimum grid drive can best be determined under actual on-the-air conditions, using feeder current as an indication of maximum output. Those who plan

(Continued on page 106)

Preventing Self-Oscillation in Tetrode Amplifiers

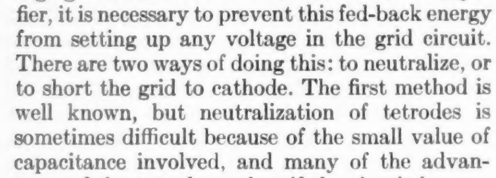
Cathode Followers as Drivers for Beam Tubes

BY PAUL D. FRELICH,* W9ECO

• Here is a step in the right direction toward taming wild or even house-broken tetrode amplifiers. One way, of course, is to neutralize the beastie, but W9ECO uses another approach which shows considerable promise when handled properly.

ANYONE who has tried to operate a tetrode at the higher frequencies must wonder why the claim "neutralization usually unnecessary" doesn't read "neutralization unusually necessary"!

It is an accepted fact that the grid-to-plate capacitance, though small, is the chief cause of instability in tetrode amplifiers, especially at the higher frequencies. This small capacitance feeds energy from the plate circuit back to the grid circuit and can readily set up oscillations of the tuned-grid tuned-plate variety, because of the high gain of the tubes. To stabilize such an amplifier, it is necessary to prevent this fed-back energy from setting up any voltage in the grid circuit. There are two ways of doing this: to neutralize, or to short the grid to cathode. The first method is well known, but neutralization of tetrodes is sometimes difficult because of the small value of capacitance involved, and many of the advantages of the tetrode are lost if the circuit is complicated by neutralizing. The second method introduces the problem of exciting the grid and at the same time shorting it to the cathode. Although this may seem paradoxical to the uninitiated, the solution is to use a zero-impedance generator. Fig. 1 shows the basic circuit of a tetrode amplifier drawn in two different ways, and it is obvious from Fig. 1-B how effectively the theoretical $Z_g = 0$ shorts the grid. In practice, however, it is impossible to find a generator of zero impedance, but fortunately when a cathode-follower driver is used, then Z_g will be equivalent to only a few hundred ohms.[1] If Z_{gp} is many times this value, the resultant voltage division is practically the same as if a zero-impedance generator were used.



(A) (B)

Fig. 1 — **The simplified diagram of a tetrode amplifier is shown at (A). The grid circuit is represented by a generator and an impedance Z_g. The diagram in (B) shows another way of drawing the circuit to illustrate feed-back from the plate circuit of the tube through the grid-plate capacity (represented by Z_{gp}). The tube has been replaced by its equivalent diagram and the plate load is represented by Z_L. Note that Z_g and Z_{gp} form a voltage divider, and that the voltage developed at the grid is proportional to the ratio of Z_g to $(Z_{gp} + Z_g)$. Obviously if Z_g is very small or zero, there will be little or no voltage developed from grid to cathode.**

A good way to evaluate the effectiveness in preventing oscillation of the low Z_g presented by a cathode-follower driver is to use the equation quoted on Page 112 of June *QST*, which can be rearranged to state that the maximum R_g (Z_g) a tube can have without oscillating is

$$R_g = \frac{2\left(1 + \frac{r_p}{R_L}\right)}{2\pi f \mu C_{gp}} \qquad (1)$$

where r_p = plate resistance of tube
μ = amplification factor of tube
R_L = plate-tank impedance at resonance
$R_g = Z_g$ = shunt grid impedance
C_{gp} = grid-plate capacitance of tube
f = frequency

Suppose an 807 is excited by a 6V6 cathode-follower driver where, for the 807,
r_p = 0.1 megohm,
μ = 600,
R_L = 50,000 ohms (unloaded tank impedance),
C_{gp} = 0.2 μμfd. max.,
$R_g = Z_g$ presented by 6V6 cathode follower, and
f = 30 Mc.

Substituting in (1) above, R_g = 265, and hence Z_g must be greater than 265 ohms for the 807 to oscillate. Since it is practicable to build a 6V6 cathode-follower driver which presents a Z_g of less than 265 ohms, the 807 will definitely not oscillate.

When R_L is 3000 ohms, corresponding to a

* 54 Canterbury Road, Waltham 54, Mass.

[1] Henry, "Improved Driver Stages for Class-B Amplifiers," *QST*, Nov., 1945.

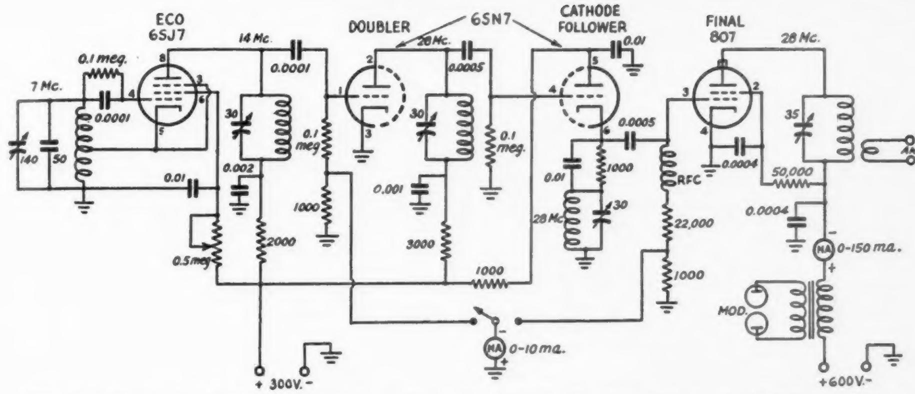


Fig. 2 — **The author's 28-Mc. transmitter, illustrating the application of the cathode-follower driver.**

loaded tank circuit, Z_g can be as high as 3035 ohms before oscillations begin, and, since the Z_g is less than 265 ohms, a large margin of safety exists.

Cathode-Follower Drivers

When considering a cathode follower as a driver, the following must be known:

1) C_{gp} of tube to be excited.

2) Z_g presented by the cathode follower.

3) Total shunt capacitance in the cathode-follower cathode circuit.

4) Peak grid swing required for the excited tube.

5) Grid-drive power required for the excited tube.

Items 1 and 2, used in conjunction with the equation discussed above, determine the maximum frequency at which the cathode follower will prevent oscillations. In Item 2

$$Z_g \doteq \frac{1}{g_m} \tag{2}$$

where g_m is the mutual conductance of the follower. Item 3 will determine the maximum frequency at which useful power can still be obtained from the cathode follower. Suppose, for instance, the total cathode shunt capacitance is 30 $\mu\mu$fd. At 28 Mc. this represents approximately 200 ohms and is not a good load for a follower to work into. But by resonating this capacitance in parallel with 200 ohms of inductive reactance having a Q of 200, the load into which the follower will work will be 40,000 ohms in parallel with the resistance load of the amplifier grid (about 20,000 ohms for the 807), and the resultant 13,330-ohm load is quite adequate.

Items 4 and 5 will determine the type of cathode follower to use and how much d.c. power it will need. For example, from published characteristics, an 807 requires a peak grid swing of approximately 115 volts, with approximately 0.4 watt of grid-drive power. One half of a 6SN7GT, operating as a Class A cathode follower with a d.c. input of 3 watts (300 volts at 10 ma.) is capable of a little better than 115 peak volts and about ¾-watt output; its efficiency is 25 per cent and the Z_g it presents to the 807 is about 400 ohms. The grid-drive *power* required by the follower is negligible, since the grid does not draw current. All that is needed is voltage swing (approximately 120 peak volts). A quadrupler should therefore work nicely into the cathode-follower grid.

If more voltage swing and power output are needed, perhaps to drive an 813, a 6V6 tetrode-operated cathode follower will give about 200 peak volts and approximately 4.5 watts output, with 12.5 watts input (250 volts at 50 ma.). It will have a plate efficiency of 36 per cent and will present a Z_g of 250 ohms.

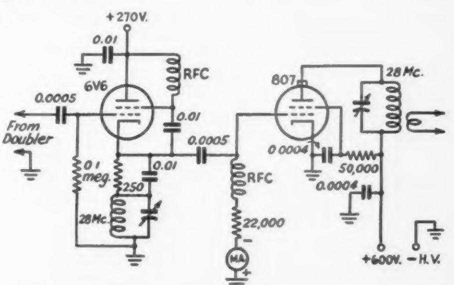


Fig. 3 — **A 6V6 or other tetrode can be used as a cathode-follower driver where more drive is required.**

In my own case, after prolonged testing of the 6V6 and 6SN7GT for driving an 807 rig, I finally settled on the 6SN7GT because one section could be used as a doubler and the other section as the cathode-follower driver, thus cutting down the number of tube envelopes as well as the amount of d.c. power required.

The 6V6 has reserve excitation, while the 6SN7GT has only just enough power output to drive the 807 for 'phone operation, or twice the grid drive needed for c.w. All these measurements were made at 30 Mc., which is about the upper limit for the 6SN7GT as a cathode follower. Although no difficulty should be encountered at

(Continued on page 108)

A New Kind of Skyhook

Combining the Kite and Balloon

BY D. T. FERRIER,* W1LLX, AND W. G. BAIRD,** W9RCQ/1

• Here's a new wrinkle on getting a Field Day antenna high up in the air in a hurry. This "skyhook," with its accessories, makes up a compact unit when not in use and can be conveniently transported with the rest of the gear.

Most amateurs at one time or another have dreamed of owning skyhooks to support their antennas. Very little amateur work has been done with balloon- or kite-supported antennas — at least the only published reports are articles in *QST* for April and November, 1940, describing the use of meteorological sounding balloons and kites as supports for antennas. While both methods achieved moderate success, many shortcomings were self-evident.

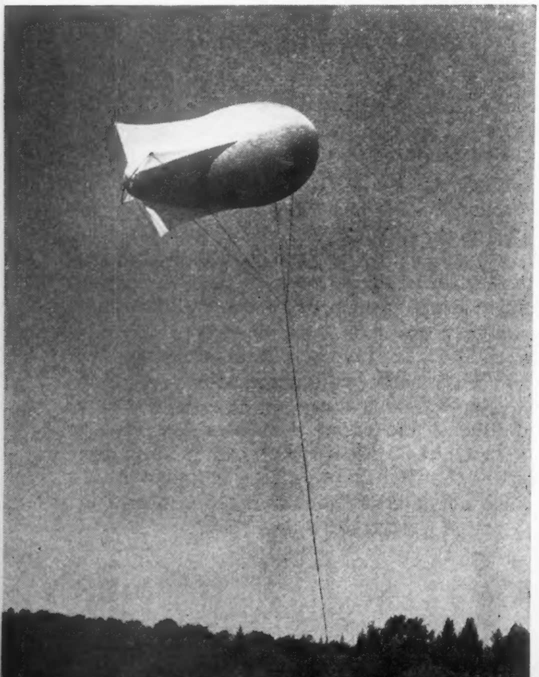
Balloons and kites were supplied with the Gibson Girl life-raft transmitter during the war for carrying antennas, but again the balloons and kites had serious drawbacks. Balloon-supported antennas tended to be blown down into the water or toward the ground in high winds, and the kites could not be flown without a wind. Satisfactory performance was possible only over a very narrow wind-velocity range with either.

The Kytoon[1] which we used in the recent Field-Day Contest is an air-foil balloon which flies partly on the principle of a balloon and partly on the principle of a kite, and thus incorporates the good qualities of both. It is inflated with hydrogen or helium and, in a dead calm, exerts its lifting force as does a balloon because it is lighter than air. As soon as the wind rises, kite action exerts an upward pressure on the air foils, increasing the lifting ability of the Kytoon by three or four times that of the free-balloon lift alone.

The construction of the Kytoon is illustrated by the accompanying photograph and Fig. 1. It is 6½ feet long and 39 inches in diameter, tear drop in shape. The casing is made of light, strong Nylon fabric which encloses a specially-shaped bladder or balloon made from Neoprene. The foil wings are made of a lightweight cotton balloon cloth and are supported by aluminum-alloy struts which fit into sockets on an aluminum spider at the stern of the Kytoon. The filling valve projects through a hole in this spider. The Kytoon itself weighs 1.62 lbs., and when folded can be carried in a package 14 inches long and 3 inches in diameter. No special claims as to lightweight portability are made because the separate cylinder for charging the balloon weighs in the vicinity of 25 pounds.

Filled with hydrogen under a pressure of 4 inches of water, the Kytoon has a volume of 40 cubic feet, and a net (or free) lifting force in a dead calm of 1.23 lbs. In a 3-m.p.h. wind, the lifting force is increased by the action of the air foils so that it will carry a net load of 2.6 lbs. Under these or more favorable conditions of load, and wind velocity, the angle with the horizontal at which the Kytoon flies is never less than 45°. The objections to kites and spherical balloons are thereby overcome. The substitution of helium for

* Harvey Radio Laboratories, Inc.
** Dewey & Almy Chemical Co.
[1] Trade-mark Reg. U. S. Pat. Off.



The "Kytoon" in action. The combined balloon and kite action ensures proper flight under varying wind conditions and keeps the antenna more nearly vertical than is ordinarily possible with either a kite or balloon.

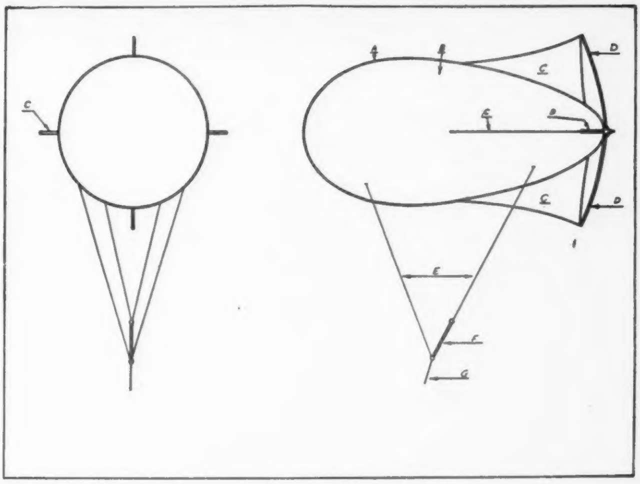


Fig. 1 — **Outline sketch of the Kytoon. The length is 6 ft. 6 in., diameter 3 ft. 3 in., and wingspread 4 ft. 3 in. Labeled parts are as follows: A, casing; B, Neoprene bladder; C, wings; D, wing struts; E, flying bridle; F, rubber band to allow stem to rise in a strong wind; G, flying line.**

hydrogen results in reduction of the free lift by about 10 per cent.

During the recent Field-Day Contest, a Kytoon was used by the authors at W1LLX/1, Winchester, Mass., with a vertical antenna 132 feet high (No. 18 enameled copper wire), and at W9RCQ/1 at Wayland, Mass., with a vertical antenna 396 feet high (No. 18 braided copper wire). Our results on 80 meters were so good that we both say that the Kytoon gave us the best 80-meter antenna we had ever used.

About the Authors

• William G. Baird, jr., W9RCQ/1, has been an active DX-er, rag-chewer and experimenter since receiving his ticket in 1934. Bill's collection of the exclusive DXCC, WAS, WAC, and A1 Operator certificates attest to the successful activity he has enjoyed. W9RCQ/1 served as a 1st Lt. in the Army's C.W.S., where he did research and development work on the incendiary bomb. He is a graduate of Washington University, St. Louis, with B.S. and M.S. degrees in chemical engineering, and at present is employed as a chemical engineer with the Dewey & Almy Chemical Co.

• David T. Ferrier, W1LLX, isn't the newcomer to our hobby that his call suggests. He started in the game early, in 1921, as 9BMN, and since then has also been W6BHV and W3GKZ. A graduate of the U. S. Naval Academy, '29, and Harvard, '39, he holds B.S. and M.S. degrees. He's WAS, WAC, ORS, and an A1 Operator Club member. During the war W1LLX was a Navy liaison officer at MIT's Radiation Lab and at Harvard's Research Lab.

At W9RCQ/1, a 132-foot horizontal was used as a comparison antenna, and at distances up to 300 miles, the vertical brought much better signal reports. Both were end-fed antennas, and 25 watts was fed to the 807 final. One-hundred-and-thirty-two stations were worked on 80-meter c.w. by one operator. The Kytoon flew for 30 hours with no attention throughout the contest, and stayed within 20 degrees of the vertical in winds estimated to have been 20–30 miles per hour.

The Kytoon should be a handy device for emergency transmitter set-ups, obviating the need for carrying around bulky portable antenna masts. It is, of course, tops for Field Days and should prove an interesting gadget for elevating high-frequency antennas, test instruments, and a host of other things in which amateurs and experimenters are interested. Perhaps long-wire vertical antennas can now be exploited with outstanding results.

Strays

W4EFH tells of an interesting short-skip experiment successfully carried out on 28-Mc. 'phone on June 8th. Calling CQ at 6:50 P.M. and announcing that he would endeavor to work as many stations as possible within an hour's time, W4EFH worked 22 stations in rapid-fire succession, for an average of one contact every 2 minutes and 42 seconds. Stations cooperating in the effort were: W3CRY, EAI, IAG; W4AIT, AJT, BVD, CYU, DIS, EIW, FT, GIA, HMG, HSM, HZG, IEO, IRY, ITY, ML; W5GBA; W6-PCK/4; W9JML, KRY. Many others were heard calling but could not be QSOed within the hour.

Happenings of the Month

LICENSING & RENEWALS

Under the heading "New Licensing Plan" we had an item in last month's "Happenings" reporting the adoption by FCC of a simplified amateur application form and a "paper" amateur license the mechanics of which would greatly speed up the issuing of amateur licenses. The new form is now in distribution at the FCC field offices but at this writing there is some doubt whether the new form of license will ever see the light of day. The reason is that it was devised as a means to speed up the output and in the meanwhile, before it had gone into effect, FCC has succeeded in getting substantially current on the big job that confronted it. Amateur examination papers are now being graded within a week of their receipt in Washington and the big backlog of applications has melted away. We shall have a further report on the future of the "paper" license in our next issue.

Because of the favorable status of its work in amateur licensing, FCC is now able to invite renewal applications from certain categories of amateurs: *(1) All amateurs located at addresses other than those specified in their licenses, and regardless of call area or date of expiration, are now requested to file their renewal applications immediately with FCC.* This will permit the amateur to escape from signing the portable indicator, and from FCC's standpoint it will put the correct address on file. *(2) All amateurs in locations where the station call is due to be changed, because of a change in call areas, and regardless of whether there has been a change in actual location and regardless of date of expiration, are now requested to file renewal applications with FCC.* Thus amateurs whose calls must be changed will get their new calls sooner than previously anticipated, can begin building their reputations under their new calls, and we'll get correct listings in the callbook that much sooner. Get a Form 610 from your inspector, fill it out and *attach your old licenses,* and send direct to FCC at Washington.

You will have no difficulty with the new application form. It is only a page long and eliminates many of the previous questions. It is a combined application for station and operator licenses, which hereafter will automatically be issued in combination — so that the applicant is given a station call and authorized to operate a station whenever he acquires the apparatus.

Amateurs still living at the licensed address, and in locations where the call area has not been changed, are not yet requested to file renewal applications before they are due. You should, however, keep your expiration date in mind and file your application at FCC a couple of months before that date.

FCC orders in the 115 series automatically have so extended the terms of operator licenses that the first of them valid at the time of Pearl Harbor are not due to expire until December 7, 1946. By its Order 130-F, the Commission has extended the term of your station license to coincide with that of your operator ticket, so that both are due to expire simultaneously.

Let us now reëxamine the situation concerning when renewal applications should be filed — other than the special cases previously discussed. Dig out your operator ticket and look at its date of issuance. You can then determine, from the table below, the date of expiration of your license and the period during which your renewal application should be submitted:

I *Date of Issuance:*	II *Valid Until:*	III *Apply for Renewal:*
Between December 1st and December 7th in each of the years 1939–1944, inclusive.	Same day and month in 1947 as day and month of issue.	Apply for renewal sometime in the 120-day period prior to date determined in Column II.
Between December 7th and December 31st in each of the years 1938–1943, inclusive.	Same day and month in 1946 as day and month of issuance.	Any time from now to date of expiration this December.
Between January and November, inclusive, in each of the years 1939–1944, inclusive.	Same day and month in 1947 as day and month of issuance.	Apply for renewal sometime in the 120-day period prior to date determined in Column II.

After December 31, 1946, proof of use as a condition for renewal is required. Proof of use is established by submitting evidence of three contacts, using radiotelegraphy, some time during the last six months of the license period.

STAFF NOTES

Vernon Chambers, W1JEQ, after war service in Jim Lamb's Remington-Rand laboratory at Middletown and as an AAF sergeant on special assignment with guided missiles, has returned to our staff as an assistant in the technical department. He was a popular prewar *QST* author of constructional articles on simpler equipment, and with his additional wartime schooling and ex-

perience in new fields he will be branching out in *QST* and the *Handbook* before long.

The headquarters staff now numbers 60 persons but still we can't keep up with our workload. Membership is currently growing nearly 2000 a month and *QST* distribution is at an all-time high. All our little problems multiply accordingly. For instance, the thousands of returning service men and the wholesale relocations following the war are resulting in the greatest load we have ever had in changing the addresses of members. A simple enough problem, you might think, but it requires the full time of several clerks and we wish we had more. We plead for your patience until we can get "out of the woods." It will help to get you prompt service if you will send membership applications and renewals direct to ARRL rather than through a magazine subscription agency, most of the latter being themselves so overloaded that they frequently delay the matter several months; and it will also speed things up if your orders for other publications and "membership supplies" are sent in separately from your membership application.

CALL-LETTER PHONETICS

Earlier this year, the Commission put into our rules a prohibition against using the names of countries, states or cities when employing phonetic aids for call-letter identification while using telephony. The idea was to avoid confusion between such names given in the call and the actual location of the station, but a lot of the boys didn't like it and the League's Board at its meeting this year voted to ask the Commission to withdraw the restriction. It has now done that, by amendment of §12.82(d) so that it now reads simply:

§12.82(d) When using telephony, phonetic aids to identify the call of the station may be employed.

TWO-LETTER CALLS

If you ever held a two-letter call in any district and would like to have one again, you can — providing there are still some unassigned in your district now — under the terms of a new amendment added last month to §12.81 of our rules by the Commission. The new provision reads:

§12.81(a) (5). An unassigned two-letter call (a call having two letters following the numeral) may be assigned to a previous holder of a two-letter call.

What this means is that not only may a new or renewing amateur applicant ask for such a call, if he has previously held a two-letter one, but that existing holders of three-letter calls who want to exchange them may do so, if they have ever held two-letter calls. The procedure is to apply to the FCC at Washington for a modification of station license, on the usual form, requesting a two-letter call instead of the existing three-letter one, and giving information on the former two-letter call held by the applicant. If there are any available, you'll get one.

FCC, while it will honor such applications as long as two-letter calls last, hopes that many three-letter holders eligible under the new rule will prefer to keep their present calls; they're still pretty heavily loaded and all these special cases mean just that much more work.

ARE YOU LICENSED?

• When joining the League or renewing your membership, it is important that you show whether you have an amateur license, either station or operator. Please state your call and/or the class of operator license held, that we may verify your classification.

DX QSLs

• "Claim your old QSL cards now or never," says page 31 of July *QST*, because all prewar cards not applied for by next January 1st will be disposed of at that time, by order of the ARRL Board of Directors.

If you did any hamming prewar, some of these DX cards may be for you! Look up the July article and submit the required self-addressed stamped envelope to your QSL Manager now.

HIGH-SEAS MOBILE

Sometimes a ham has occasion to operate his station mobile on board either a ship or aircraft when outside the limits of any of the call areas set up by the FCC. How he signs to indicate his status under such conditions has always been a problem. This spring the FCC asked the League for its recommendations and at its May meeting the Board produced some which have now been incorporated by the Commission in a new subsection (e) to §12.82 of our rules:

§12.82(e). In addition to complying with the requirements of paragraph (a) above, an operator of an amateur station operated as a mobile station aboard a vessel on the high seas, or aboard an aircraft en route in an international voyage, shall, when the vessel or aircraft is outside the 10 call areas prescribed by the Commission in §12.81(b), comply with the following calling procedure:

(1) Mobile operations aboard a vessel.

(i) When using telegraphy the amateur operator shall transmit immediately after the call of the station the fraction bar DN followed by the designator MM to indicate that the station is being operated as a mobile station aboard a vessel. In addition, the name of the vessel and its approximate geographical location shall be transmitted at the end of each transmission immediately prior to signing off. If the vessel does not have a name, the number of the vessel shall be transmitted in lieu of the name of the vessel.

(ii) When using telephony the call of the station shall be preceded by the words 'this is', or the word 'from' followed by the words 'maritime mobile', to indicate

that the station is being operated as a mobile station aboard a vessel. In addition the name of the vessel and its approximate geographical location shall be transmitted at the end of each transmission immediately prior to signing off. If the vessel does not have a name, the number of the vessel shall be transmitted in lieu of the name of the vessel.

(2) Mobile operations aboard aircraft.

(i) When using telegraphy the amateur operator shall transmit immediately after the call of the station the fraction bar DN followed by the designator AM to indicate that the station is being operated as a mobile station aboard an aircraft. In addition, the number of the aircraft and its approximate geographical location shall be transmitted at the end of each transmission immediately prior to signing off.

(ii) When using telephony the call of the station shall be preceded by the words 'this is', or the word 'from' followed by the words 'aeronautical mobile', to indicate that the station is being operated as a mobile station aboard an aircraft. In addition, the number of the aircraft and its approximate geographical location shall be transmitted at the end of each transmission immediately prior to signing off.

HANDPRINTING CODE

Referring to our item in last month's "Happenings" on this subject, the FCC has now formalized the matter by an amendment to §12.47 of our amateur rules so that it now reads "Code tests shall be written *or hand printed* with either pen and ink or with pencil." (Italics ours to indicate the new material.)

EXAMINATIONS CANCELED

Since early in the war, the FCC examining points for the amateur license have included the primary monitoring stations at Grand Island, Nebr.; Allegan, Mich.; and Kingsville, Tex. Now, because of the need for these stations to concentrate all their efforts on their primary function of monitoring, FCC announces that, effective October 1st, all license examinations and related functions are discontinued at these three points.

25 Years Ago
this month

OCTOBER, 1921, *QST* — the biggest to date — arrived late, but we'll accept the editor's apologies. He was at Chicago, too! Our ARRL First National Convention & Radio Show is glorious history. Over 1200 amateurs, representing every U.S. district and Canada, attended along with several hundred of the Chicago gang, and only now is the smoke clearing from the immense Sixth Regiment armory and the Edgewater Beach, Sheridan Plaza and Drake hotels. The greater part of this issue records the convention story.

Chairman Mathews, 9ZN, called the delegates to order, followed in turn by many addresses of welcome, including one by Chief Radio Inspector Terrell, representing Secretary Hoover of the Commerce Department. Keynoting the convention, our ARRL president, Hiram Percy Maxim, spoke in part:

. . . I cannot but feel that in the years to come much will be said of what we do here at this first convention. We are striking out into the unknown, and even the smaller actions which we take here during the next few days will weigh heavily in the future, for they will establish precedents and standards. We must try our best to regard things in a large way, with the perspective of the coming years before us. Let us not forget that we are pioneers, blazing a way that many are to follow. . . . Let us strive to overlook those things which are petty and small.

"Power Factor!!" The double exclamation marks are those of *QST*'s editor, registering the heat of the West-Stone debate on this long-smoldering subject, a convention highlight. For months now, top authorities have been arguing the power-factor question. Is it zero, unity, or what have you? *QST*'s pages have presented both sides of the argument, with M. B. West, prewar 8AEZ, and Ellery W. "A-P" Stone leading the opposing factions. Hardly had the first evening's spark meeting started, with Mr. West speaking on "Spark Transmitters," when a slight digression introduced mention of power factor. The fuse was lit. The dapper Mr. Stone, who had come east from San Francisco especially to discuss the explosive subject, followed Mr. West on the rostrum, and things began to happen. Reports *QST*, "Staunch supporters of the two main participants rushed to their respective colors, the air was full of cries to the chairman for recognition, and at one time we witnessed the spectacle of six good men and true talking their respective versions of Power Factor at the same time, three of them on the platform trying to draw diagrams on the same blackboard while they talked."

Other authorities, Messrs. Simpson, Wiggin and Robinson, joined the melee, but it eventually became evident that the principals were widely separated on definition. As the night wore on, it was decided to put the question up to the Bureau of Standards. Next day came a learned telegraphic reply which was hastily adopted by both sides as favoring their cause. To preserve order, a committee consisting of Messrs. Maxim, Jansky, Robinson, Skifter and Stewart was chosen to decide the issue with the information at hand. Their decision: ". . . it is the unanimous opinion of the Board that the two gentlemen are not using the same nomenclature and that they are not reasoning from the same premise." The decision made no settlement of the argument. We should be hearing more about power factor.

As temperatures returned to normal, convention routine was resumed. Speeches followed

(Concluded on page 114)

A Simple "Wien Bridge" Audio Oscillator

Good Waveform and Uniform Output Amplitude

BY HOWARD T. STERLING *

• That ever-useful device, the audio-frequency oscillator, in simple and reliable form. Where continuous tuning is not required, any desired number of spot frequencies can be provided by a selection of resistors and a multiposition switch.

When considering building an audio oscillator it pays to think twice. There are three major types of audio oscillators: the *LC* oscillator with which we are familiar from work with r.f., the beat-frequency oscillator, and the resistance-capacitance tuned oscillator. The *LC* oscillator will produce a very satisfactory note for code-practice work and the like, but for test purposes its waveform usually leaves much to be desired; also, when the frequency is varied the amplitude does not remain constant, and the necessary components for tuning are not conveniently obtainable. The beat-frequency oscillator is very satisfactory in operation when properly designed electrically and mechanically, but the fine points of this design are rather subtle and not readily understood by most of us. To get proper frequency spread with a beat oscillator it is necessary to use a peculiar condenser-plate shape

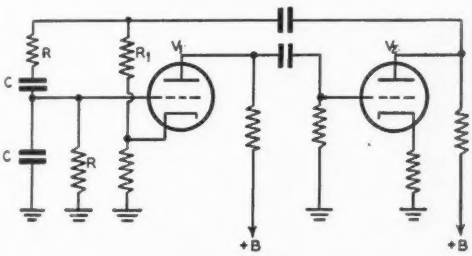


Fig. 1 — Essentials of the "Wien bridge" oscillator circuit. Frequency is determined by the values of *R* and *C*; oscillation amplitude by the proportion of the output voltage fed back to the cathode of V_1.

(which is very hard to obtain commercially), and there remains the constant headache of properly setting the oscillator to zero.

But the *RC* oscillators suffer from few of these disadvantages. The phase-shift oscillator is a very pretty little device that will be appreciated by anyone having an understanding of *RC* theory, and its one-tube simplicity would recommend it to one and all were it not that there is no immediately practical way of regulating its output. But in the so-called Wien bridge[1] oscillators even this objection is overcome.

The Wien bridge oscillator has long been a mystery to most of us and hence is in our minds surrounded with an aura of superstitious awe. Some of us have built them with very unsatisfactory results, and we have the feeling that choice of components or arrangement must be far too critical. It is unfortunate, too, that much has appeared in the literature that is confusing, including circuits that look as though an engineer would be needed to untangle them.

The Wien bridge oscillator need be only a very simple device, as shown in Fig. 1. It would be hard to improve on at least one explanation[2] of the operation of this circuit, but a little simplification might be to the point. The two-tube resistance-coupled amplifier is straightforward enough, and it will be seen that we carry the output back to the input. This output is fed to the cathode of V_1 through a voltage divider, and this feed-back is degenerative and constant with frequency. But we also carry it to the grid through the *RC* network. Now this feed-back voltage at the grid is regenerative and is different with different frequencies, and varies also in phase. Fig. 2-A gives a rough idea of this characteristic. Again referring to Fig. 1, it will be seen that to make the circuit oscillate it will be necessary to introduce a signal between grid and cathode of V_1 in the same phase as the voltage at the plate of V_2 and of sufficient amplitude (output voltage/amplifier gain) to maintain oscillation. The voltage between grid and cathode of V_1 will be equal to the algebraic sum of the voltages on the grid and the cathode with respect to ground. Now when we are far from the frequency of oscillation the net voltage between the grid and cathode will be opposite in phase to that necessary for oscillation; that is, the negative feed-back will predominate. This is because the regenerative signal to the grid is small and is also in the wrong phase (by almost ninety degrees) to be a significant factor in the algebraic sum. Only at "resonance" will the phase of the signal at the grid be exactly opposite to that on the cathode, and only then — if the degenerative voltage fed back to the cathode

*70 Morningside Drive, New York City.

[1] The circuit discussed is not truly a Wien bridge oscillator. We realize this, but bow to popular usage which has named this oscillator because of the resemblance between its frequency-determining circuit and that of the Wien bridge.

[2] Terman, *Radio Engineers' Handbook*, page 505.

is properly adjusted — will there be sufficient net regenerative feed-back to make the circuit oscillate. Fig. 2-B shows the effective regenerative voltage fed to the grid at a level just below oscillation. Comparing this with Fig. 2-A gives some indication of the importance of the phase relationship in the algebraic sum.

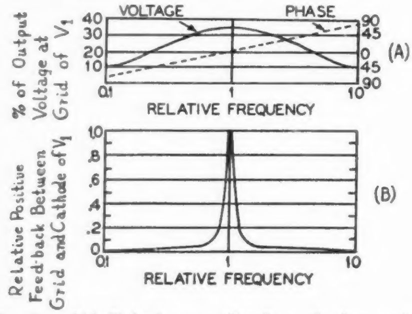


Fig. 2 — **(A) Relative amplitude and phase of the positive feed-back voltage between the grid of V_1 and ground, with reference to output voltage of V_2. (B) Effective positive feed-back voltage between grid and cathode of V_1 for the same conditions as in A.**

It will now be seen that the circuit is critical in just two respects; the constants of the frequency-determining circuit and the amount of degenerative feed-back. The amplifier can be anything so long as it has negligible phase shift over the range to be used and provided that it can drive the low impedance offered by the degenerative voltage divider and the Wien bridge network. If we replace the lower member of the degenerative voltage divider with a filament-type bulb whose resistance will increase as the oscillation amplitude increases, thereby increasing the proportion of the feed-back voltage present at the cathode and stabilizing the oscillation level, we can set the degeneration level once (with R_1) and forget about it.

Frequency Determination

The frequency of oscillation is determined by the values of R and C, and

$$f = \frac{1}{2\pi\sqrt{R_1R_2C_1C_2}}, \text{ or } f = \frac{1}{2\pi RC}$$

in the case where the Rs are equal and the Cs are equal. It doesn't matter from the standpoint of waveform exactly what proportion the Rs and Cs bear one another (because the circuit will balance with nearly any values) just so long as when the values are changed to vary the frequency *they are changed proportionally.* On this point depends consistency of waveform and amplitude with change of frequency, and this is where most builders of Wien bridge oscillators fall by the wayside. When tuning is done by means of a variable condenser it is essential that the two sections track, at least proportionately, when stray capacitances, particularly those from rotor to ground, are considered. And when resistors are switched, or variable resistors are used, the members of each pair must maintain the same proportion to one another. It will be seen that the easiest solution to the problem is to keep the Cs and Rs equal. The only other point to be remembered is that the Rs should be kept high enough (a thousand ohms or so) so that the Wien bridge network does not load the amplifier too heavily.

The problem of how to tune a Wien bridge oscillator is an interesting one. Most of those in recent literature have been modeled after the Hewlett-Packard oscillators and call for four-gang condensers. A four-gang condenser wired as two-gang will provide a capacitance range and hence a frequency range of over ten-to-one, which permits the audio band to be split up into decades. Since four-gang condensers are not readily available a two-gang condenser may be used instead, and will provide a frequency range of about 3-to-1, or two ranges per decade.[3] This results in better

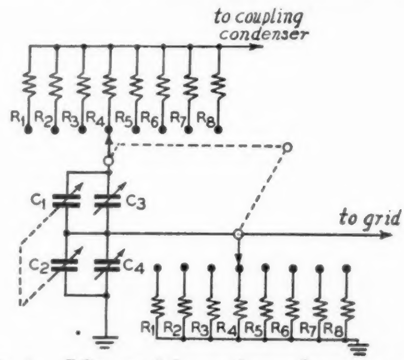


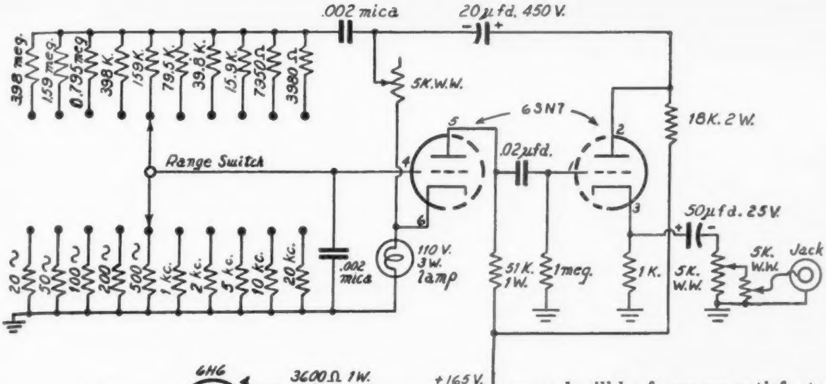
Fig. 3 — ***RC* network for continuous frequency coverage from 15 cycles to 150 kilocycles per second. C_1 and C_2 are sections of a two-gang 450-μμfd.-per-section variable condenser. C_3 and C_4 are 150-μμfd. trimmers. The following table gives resistor values and frequency ranges:**

Resistors	*Values*	*Frequency range*
R_1	20 megohms	15 to 50 cycles
R_2	6 megohms	50 to 150 cycles
R_3	2 megohms	150 to 500 cycles
R_4	600 kilohms	500 to 1500 cycles
R_5	200 kilohms	1.5 to 5 kc.
R_6	60 kilohms	5 to 15 kc.
R_7	20 kilohms	15 to 50 kc.
R_8	6000 ohms	50 to 150 kc.

bandspread, although it does require more bands to cover the audio spectrum. Such an arrangement is shown in Fig. 3, and may be substituted for the frequency-determining network in any circuit calling for a four-gang condenser.

Tuning by use of ganged potentiometers is perfectly satisfactory provided that the pots can be made to track. This throws out any thought of

[3] By the exercise of extreme care in regard to stray capacitance and the like it is possible to tune this type oscillator over a range of ten-one-to with a two-gang condenser. This requires that the total capacitance from stator to ground does not exceed about 40 μμfd. This care is justified when it is desired to build an oscillator of wide frequency range into a very small space.



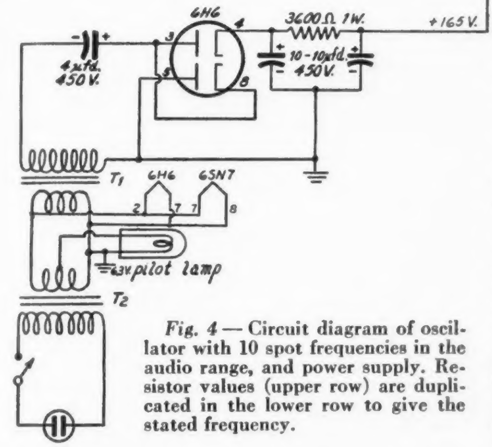


Fig. 4 — **Circuit diagram of oscillator with 10 spot frequencies in the audio range, and power supply. Resistor values (upper row) are duplicated in the lower row to give the stated frequency.**

spread will be far more satisfactory than the conventional oscillator using a four-gang condenser and a frequency range of ten-to-one.

Fig. 4 shows an audio oscillator using this switch-tune system, together with a slightly unconventional but completely satisfactory power supply which was used in it. A 6SN7 provides the two triodes which are necessary for the oscillator, and a 6H6 is used as a half-wave voltage doubler to provide the 165-volt "B" supply needed by the oscillator. Two filament transformers are used back-to-back to provide filament voltage and line isolation for the "B" supply. The first transformer has a 2-ampere winding to supply filaments as well as to drive the second (1-ampere) "plate transformer." Connecting the pilot light across only half of the 6.3-volt winding eliminates annoying glare while still providing ample visibility. With a two-pole ten-position switch the frequency range is 20 to 20,000 cycles. One of the

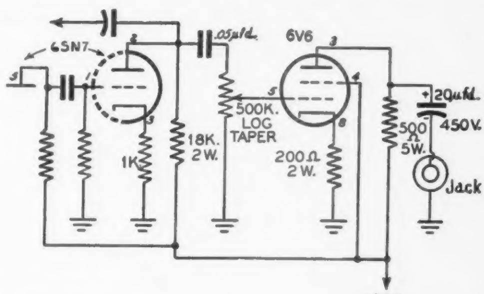


Fig. 5 — **Suggested amplifier circuit for increasing the output voltage from the oscillator.**

little Mallory wafer switches (2 pole, 9 position) may be used at the sacrifice of one frequency. So long as the members of each pair of resistors are equal the thing will work perfectly; the accuracy of frequency will be as good as the accuracy of resistance. It is suggested that the resistors be checked on a bridge, although an ohmmeter will serve to make sure they are equal. The feed-back control is adjusted for maximum output commensurate with waveform, as observed on a 'scope. If one is not available an a.c. thousand-ohm-per-

using carbon pots; they have been mentioned in the literature, but their use is incompatible with consistency of waveform and amplitude. Wire-wound pots, particularly of the type made by General Radio, are satisfactory when ganged and can be made to cover frequency ranges of one-hundred-to-one or even more. Unfor unately such pots are not usually available in any but a linear taper so that the second decade is seriously crowded. This is because the frequency curve is linear with respect to resistance.

Spot Frequencies

One of the most useful tuning systems is a switching arrangement that provides spot frequencies at three or more points per decade throughout the audio spectrum. This is very convenient for measuring amplifier frequency response because it gives you your plot points without having to tune them. It is also handy for waveform and distortion measurements. Such a system can be very compact, mechanically, and one swing of the switch carries from one end of the band to the other. The only application where it is less satisfactory than the continuously-variable type is in running response curves on highly-selective audio circuits and in checking resonance points. For this purpose, however, the scheme of Fig. 3 with its good band-

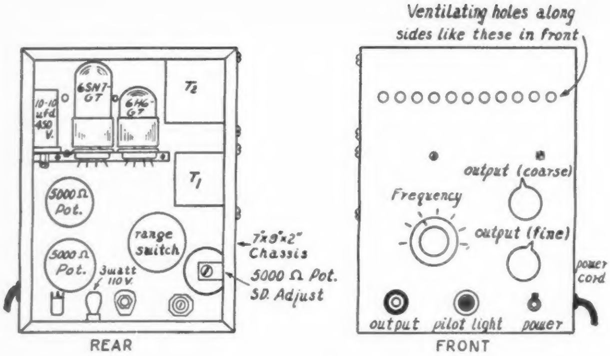


Fig. 6 — **Layout of the 10-frequency oscillator circuit given in Fig. 4. The unit can be built inside a 7×9× 2-inch chassis.**

volt meter may be connected to the output (frequency set at 100 cycles and both attenuators all the way up) and the amplitude set at about one-half maximum.

Output is taken from the amplifier cathode so that loading will not affect oscillation. The amplitude will be about two-volts peak. A double attenuator was used so as to make possible vernier adjustment of low levels for speech-amplifier adjustment and the like.

An alternative arrangement is shown in Fig. 5, using a power amplifier if more output is desired.

This oscillator was built inside a 7×9×2-inch chassis with the controls projecting through the chassis face. Fig. 6 shows the approximate mechanical arrangement. The two tubes and the double ten-μfd. condenser are mounted on a small bracket and ventilating holes are cut to keep them cool. The 3-watt bulb (which, contrary to popular superstition, does not light) and the feedback adjustment resistor are both inside. When a standard bottom plate is screwed on, the unit is a very handy thing to have on the bench.

About the Author

• Howard T. Sterling has kept pretty busy during the past few years, going to school and working in the war effort. After a year at RPI (1941) he went to work at Radiation Lab, MIT. Postwar, he is working for his degree at Columbia, and in his spare time is trying to gain those last few w.p.m. for his ham license. He holds a radiotelephone first-class ticket. His interests, strictly radio, of course, are developmental work on test equipment and remote control devices. OM Sterling's major project, though, is a broadband exciter to give a constant output of 2 watts on all bands through two meters, with no tuning other than the ECO tank condenser! We'll welcome it!

HAMFESTS SCHEDULED

October 5th, Scotia, N. Y.: The Annual Hamfest of the Schenectady Amateur Radio Association will be held at the 10–01 Club, Scotia, N. Y., on October 5th. Tickets, $3.75, with 50 cents extra for late registration. A principal feature will be a talk, "New Developments in Superhigh-Frequency Antennas," by L. M. Leeds, Consulting Engineer, General Electric Co., formerly consultant to the Secretary of War.

October 18th, Queens Village, N. Y.: The Federation of Long Island Clubs announces its Tenth Annual Hamfest, to be held at 8:00 P.M., October 18th, at the Commercial House, 96–43 Springfield Boulevard, Queens Village, N. Y. Admission will be by ticket only and price is $1.00. Each of the member clubs will put on a "skit." It is hoped there will be prizes for everyone. Clubs in the Federation are the Amateur UHF Club, Astoria Radio Club, Nassau Communications Association, Northern Nassau Wireless Association, Sunrise Radio Club, and Tuboro Radio Club. Tickets may be obtained from any of these clubs, selected radio stores, or from Louis H. Roth, 163–18 Jamaica Ave., Jamaica, New York. The sale of tickets will be limited, so it will be a case of first come, first served.

October 19th, Boston, Mass.: The Ninth Annual Boston Hamfest is scheduled for Saturday, October 19th, at Mechanics Building, 135 Huntington Ave., Boston, Mass. It will be under the sponsorship of the Eastern Massachusetts Amateur Radio Association and the South Shore Amateur Radio Club. Further information and tickets may be obtained from Frank L. Baker, W1ALP, 91 Atlantic Street, North Quincy 71, Mass.

A Soup-Can Wavemeter for the 24-Cm. Band

Frequency and Field-Strength Measurements at Low Cost

BY FREDERIC A. JENKS,* W2MTH

• For the experimenter, the 24-cm. band (1215–1295 Mc.) probably offers more possibilities than any of the other amateur u.h.f. assignments. But before you can use the band you need to know how to find it. This article tells how to make a 24-cm. wavemeter that also can be used for checking antenna patterns — at little more cost than the price of a 1-ma. meter which you've probably got already. No special tools — and no machining!

One of the most interesting of the new ultra-high-frequency bands available to the ham is the 80-Mc. spread located between 1215–1295 Mc. This 24-cm. band is located in the radio spectrum at just about the point where the operating ranges of three tube types — magnetrons, klystrons, and lighthouse triodes — overlap, which is fortunate because it offers the opportunity to get acquainted with three different u.h.f. operating techniques. However, 24 cm. is a sufficiently short wavelength to permit the use of highly-directional antenna structures, thereby effectively increasing the transmitter power.

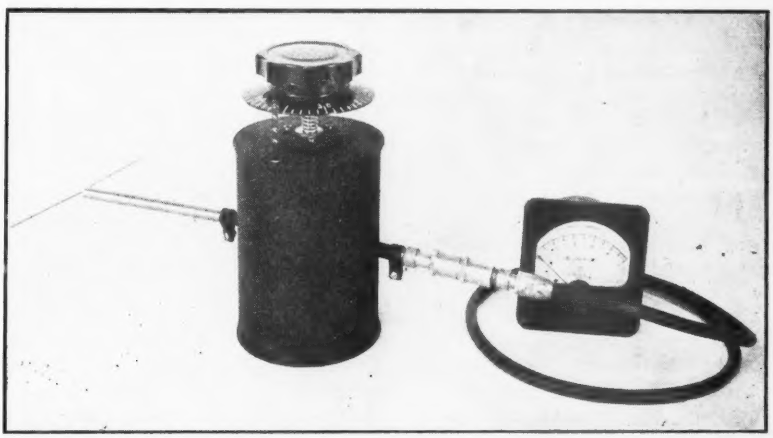
Before attempting to set up a station on this band, it is wise to become familiar with the circuit components used at these wavelengths. It is obvious that resonant circuits using coils and condensers would be impracticably small. Instead, short sections of transmission lines whose principal dimensions may be a large fraction of the wavelength are used. Transmission lines in the ultrahigh and superhigh regions are either coaxial or waveguide systems where the traveling energy is contained entirely within a metallic enclosure. Resonant circuits made from sections of these lines have decided advantages, in that they provide nearly perfect shielding and can have a much higher Q than is possible with ordinary coil-condenser combinations.

The experimenter will want to familiarize himself with at least one type of resonant circuit or "resonator" which tunes over the 24-cm. band. The simplest and probably the most useful gadget for early work at these frequencies is a wavemeter. The photograph shows one that can be made from parts found in every household. (Notice I said household and not ham shack! This is because the wavemeter is made from tin cans, copper pipe, and some nuts and bolts.) It can be used as a relative field-strength meter for taking antenna-pattern measurements as well as for frequency measurement.

The wavemeter is essentially a quarter-wave section of coaxial line short-circuited at one end. By adjusting the length of the center conductor the resonant frequency can be varied over the 24-cm. band.

As shown in Fig. 1, the magnetic lines of force set up inside the enclosure are circular about the axis, while the electric lines of force are radial along the length of the center post and then distort at its free end to fill the space beneath it. A

*Engineering Dept., Raytheon Mfg. Co., Waltham, Mass.



Disguised in black crackle, the tin-can wavemeter has a very professional appearance. This is the unit complete with dipole antenna, crystal detector and indicating meter.

single-turn coupling loop is used to feed energy into the wavemeter through a short coaxial line. Another single-turn coupling loop is used to extract energy from the resonator to feed a crystal

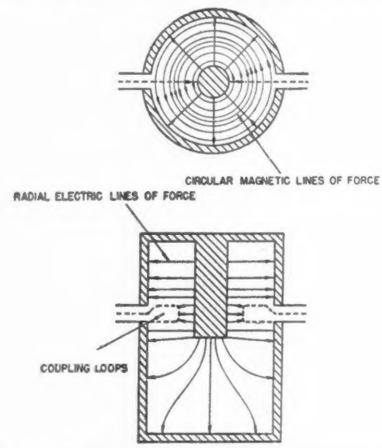


Fig. 1 — **Electric- and magnetic-field configuration inside the resonator.**

or other detecting device, as shown in the equivalent circuit, Fig. 2. This method of coupling is similar to the standard ham practice of "link" coupling between tuned circuits. Since the loops depend upon magnetic coupling to transfer energy, it is necessary that they be oriented properly within the resonator to link some of the magnetic lines of force. Maximum coupling is obtained when the loops are entirely within the resonator and their "windows" are parallel to the axis, as shown dotted in Fig. 1. Either rotating or withdrawing the loops will reduce the coupling.

How to Build It

The construction of the wavemeter is shown in cross-section in Fig. 3, while an "exploded" view of the various parts in their relative positions is given in the photograph. Notice that the adjustable section of the center conductor does not make physical contact with the larger diameter pipe, thus avoiding troublesome finger contacts. However, the opening between the two appears as a short-circuit to u.h.f. waves because the distance from this gap along the center pipe and down between the two cans to the shorting ring is an electrical half wavelength. One of the properties of transmission lines is that an impedance seen at a particular point is repeated every half wavelength along the line. Since there is an electrical short-circuit between the inner and outer cans at the soldered ring, then one-half wavelength away, at the opening between the two pipes, another short-circuit appears. The large can acts as the outer conductor for a portion of the half-wavelength line, as well as providing protection to prevent denting or distorting the inner can (the actual resonator) after calibration.

The tools necessary for building the wavemeter are familiar, and include tin snips, hacksaw, files, a soldering iron, and a drill. A 4–40 tap and a drill press equipped with a flycutter will be of help in the preparation of the parts, but are not essential. A 1/8 to 1/4-inch-thick steel plate about 6 inches square is very useful in the assembly soldering operations on the kitchen stove.

Choose a clean, undented soup can (Part A) of the Campbell or Heinz variety, 2 5/8-inch diameter rim by 4 inches long, and remove the top and bottom with a rotary-type can opener. This operation produces smooth edges and leaves a strong rim. Now choose a medium-sized vegetable can (B), 3 3/8-inch diameter rim by 4 1/2 inches long, and remove the top and bottom as before. Be sure both cans have a bright finish and not the dark wartime finish, because it is much easier to solder to the tinned surface. Clean the cans thoroughly with hot water and soap before attempting to do any soldering.

From 1/32-inch-thick sheet brass or copper cut two disks (C and D) 3 7/16 inches in diameter. These disks should be a trifle larger than the top of the vegetable can to allow space for soldering. Cut another disk (E) 2 11/16 inches in diameter, which again is slightly larger than the top of the soup can. Drill or punch a 3/4-inch diameter hole in the center of the small disk (E) and in *one* of the larger disks (D). A 3/4-inch socket punch for filter condensers is useful here. Next, cut a ring from the 1/32-inch sheet material with an inside diameter equal to the outside dimension (not the rim) of the soup can, and an outside diameter equal to the inside dimension of the *rim* of the vegetable can. With the tin snips cut this ring into two half-ring segments (F). When these two segments are soldered in place between the two cans, as shown

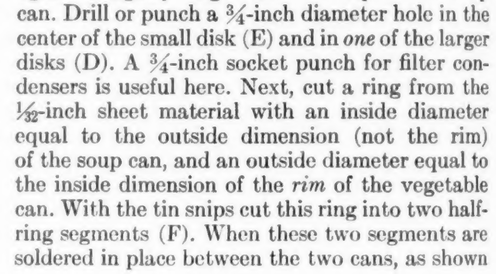


Fig. 2 — **The wavemeter circuit in terms of low-frequency symbols. The actual tuned circuit is a coaxial resonator of the type shown in Fig. 1.**

in Fig. 3, they form the actual short-circuit at one end of the half-wavelength line mentioned earlier.

Obtain a piece of brass pipe having an outside diameter of 3/4 inch with a wall thickness of 1/16 inch. Cut and file the ends square to a final length of 1 3/4 inches (G). Be sure the inside surface is smooth and clean. Take a 1/2-inch outside diameter brass pipe (H) and cut it to 2 1/16 inches in length. Solder a scrap of the 1/32-inch sheet stock

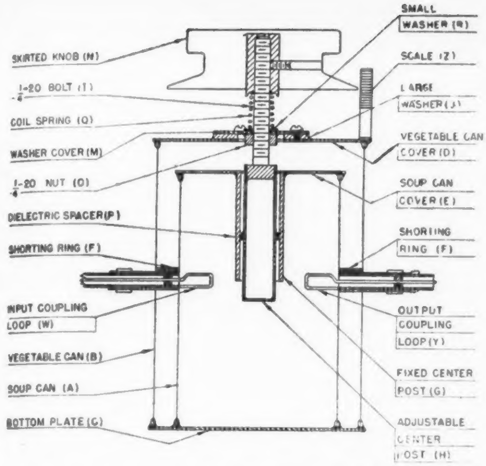


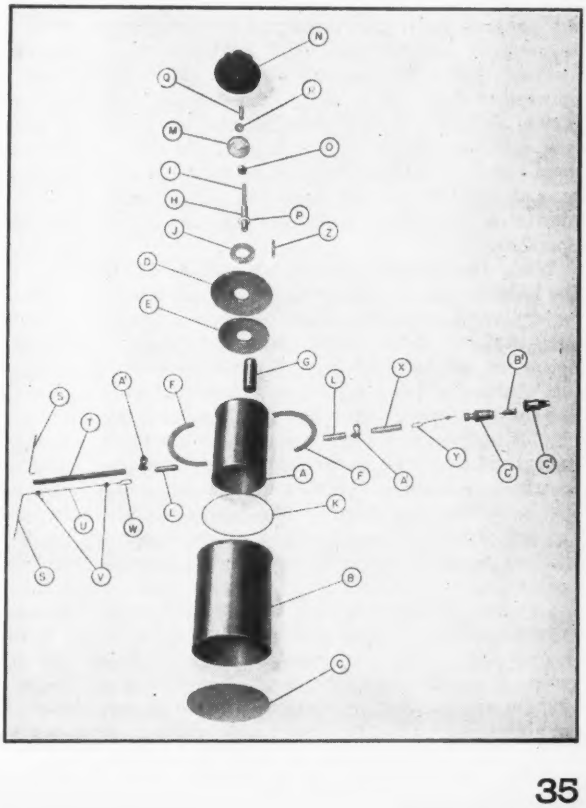
Fig. 3 — **Cross-section drawing of the assembled wavemeter. Letters in parentheses correspond to the lettered parts in the photograph.**

across one end and file smooth, making a metallic cover for the end of the tubing. Fasten the head of a two-inch ¼-20 brass fillister or hex-head machine screw (I) into the other end either with small screws or by soldering, allowing the threaded portion to protrude from the pipe. (It may be necessary to cut additional threads up to the base of the head.) Be sure the machine screw is in exact alignment with the axis of the pipe, as this assembly is the adjustable center-conductor section.

With a piece of fine emery cloth polish the small disk (E) and the ¾-inch diameter pipe (G). Tin the inner and outer edges (one side only) of the disk and around one edge of the pipe with the soldering iron (a 150–200-watt iron is desirable). Rosin-core solder could be used, but plain solder and an acid flux will produce better mechanical results. It is important to clean off all traces of the acid flux after soldering, however, to prevent corrosion. Now tin the top and bottom rims of the two cans to insure a clean soldering surface and a good electrical bond between the rims and the insides of the cans. Some cans have a sealing gasket under the rim, so this solder bond is necessary. Place the 6×6-inch steel plate on the kitchen-stove burner and heat until it browns a piece of paper. Drop the small disk (tinned side up) on the plate and stand the ¾-inch pipe in the hole. Add slightly more heat to the plate until the tinned sections turn shiny. Touch the disk-pipe joint with some solder until it flows in a clean ring around the pipe. Now place the soup can (A) on the disk, and solder the outer edge in a similar manner. When the joints are complete, turn off the heat and allow the whole assembly to cool *slowly*. Do not attempt to move anything on the plate during this cooling process!

Measure down 1½ inches from the disk on the outside of the soup can and tin a strip ½ inch wide around its circumference with the soldering iron. Emery the two half-ring segments (F) and tin their inner and outer edges. Solder these pieces to the soup can at this tinned strip. Also solder the places where the ring was cut in half. When the segments are held in place, a solid bond can be obtained by holding the iron against the joint and slowly moving it around the can.

Polish the top disk (D), and solder a 1½-inch brass washer about 3/32 inch thick (J) at its center. Be sure the washer is in the middle, and has a hole at least as large as the inside diameter of the pipe soldered to the soup can. Drill and tap three 4–40



Exploded view of the parts entering into the wavemeter assembly. Tin snips, a hacksaw, files and a soldering iron are the principal tools required.

holes 120 degrees apart into the washer-disk assembly on a 1⅛-inch diameter circle. If no tap is available, drill clearance holes through the washer and solder brass nuts to the underside of the disk.

Tin a ¼ to ⅜-inch-wide strip two inches down from one edge on the *inside* of the vegetable can (B). Slide the soup-can assembly into the vegetable can so that the ring coincides with the tinned strip and the open edges of the two cans are flush. Put several wooden spacers between the cans to keep them aligned. Make a thin ring of solder (K) and place it around the tinned area inside the large can so that it rests on the brass piece soldered to the soup can. Now hold the whole assembly horizontally over a medium gas flame, and rotate the work until the ring of solder has melted and formed a solid joint between the brass ring and the outside can. It is essential that a good electrical contact be made between the two cans at this point by the brass ring (F). A small blowtorch would be useful for this soldering operation.

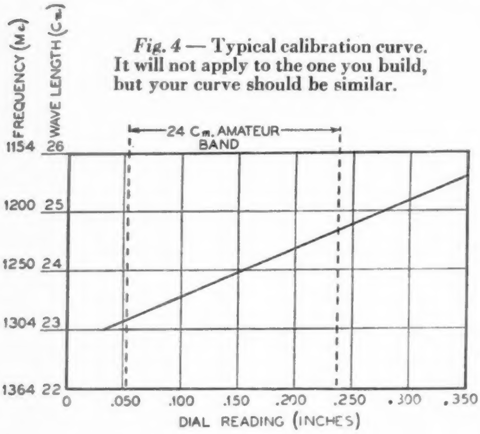


***Fig. 4* — Typical calibration curve. It will not apply to the one you build, but your curve should be similar.**

While the wooden spacers are still in place, the holes for the coupling-loop guides (L) should be drilled. Choose two sizes of copper tubing such that one slides snugly inside the other, or better yet purchase two pieces of brass "telescoping" tubing which are purposely made to slide one inside the other. In either case the inside diameter of the smaller piece should be about ¼ inch. Drill two holes in the sides of the cans diametrically opposite each other so that they come just below the brass ring (F). The holes should be the size of the outside dimension of the larger of the two pieces of tubing. Be sure to drill through both cans.

Cut two 1⅛-inch lengths of this outside tubing. Square both ends and saw six thin slots 60 degrees apart and ⅜ inch deep in one end of each piece. A wooden dowel inside the tubing during slotting might help. After polishing with emery, tin about ½ inch on the smooth ends. Slide these pieces (L) into the holes in the cans until the tinned ends are just flush with the inside of the soup can, and solder both inside and outside joints with the iron.

Remove the wooden spacers near the bottom of the assembly. With the upper spacers in place, solder the large, solid disk (C) to the bottoms of the cans, using the metal-plate-over-stove-burner technique. It is especially important that the soup can (A) make good contact with this bottom disk. Proper tinning of the cans and the disk will insure a good joint. Next, remove the upper spacers and solder the top disk (D) to the large can, with the washer on the outside. Use a wooden dowel to align the washer with the pipe (G) inside the small can. After "tacking" the disk in place with the soldering iron, the final soldering can be done on the plate. Allow time for the heat to flow through the disk to the joint, however.

On a 1¼ × 3/16 × 1/32-inch piece of sheet brass scratch lines at one end across the 3/16-inch face, 1/20 inch (0.050") apart. Ten or fifteen lines should be enough. Now bend the other end at right angles, making a 3/16 × 3/16-inch foot for the scale (Z). Solder the scale in an upright position on the top disk (D) along a radius at a distance from the center just slightly larger than the dial (N) you plan to use. India ink or black paint in the scratched lines will make them easier to read. A more elaborate scale can be made by taking a 3/16-inch diameter brass rod and cutting grooves around it 0.050 inch apart. Every fifth groove is cut wider to allow easy reading. Mill or file a flat section along the rod and stamp numerals at each wide line. Fill the grooves and numerals with white wax. A 4-40 thread at the base makes it easy to mount on the cover plate (D). The wavemeter in the illustration uses this type of scale.

Cut a brass disk (M) the size of the large washer (J), and drill a hole in its center to pass the machine bolt (I) fastened to the ½-inch pipe (H). Drill three holes spaced 120 degrees apart on a 1⅛-inch diameter circle to pass the 4-40 screws. Solder a ¼-20 brass nut (O) to the underside of this disk (M) at its center.

About 1⅛ inches down the ½-inch diameter pipe (H) used as the adjustable center conductor, build up several layers of coil dope or polystyrene tape about ⅛ inch wide. Build up enough to act as a dielectric spacer (P) between this pipe and the one inside the soup can. When the material becomes hard, shape it so that the adjustable section will turn inside the other pipe without wobbling. A ring of polystyrene or other good u.h.f. dielectric turned on a lathe is equally satisfactory.

Now thread the bolt into the nut and through the disk (M). Mount the whole unit in the resonator assembly, with the pipe going through the other center conductor (G). Fasten the brass

(Continued on page 114)

Foreign Notes

QSL BUREAUS

Here's how to get best service on delivery of your QSLs to foreign stations: simply mail cards direct to the bureau of the proper country, as listed below. These bureaus are operated by foreign amateur societies as a service to their members. Do not send foreign cards via ARRL except those for which no bureau is here listed.

Alaska: J. W. McKinley, Box 1533, Juneau.
Antigua: A. Tibbits, 27 St. Mary's St., St. Johns.
Argentina: Radio Club Argentino, Av. Alvear 2750, Buenos Aires.
Australia: W.I.A., Box 2611 W, G.P.O., Melbourne.
Belgium: U.B.A., Postbox 634, Brussels.
Brazil: L.A.B.R.E., Caixa Postal 2353, Rio de Janeiro.
British Honduras: D. Hunter, Box 178, Belize.
Canal Zone: Signal Officer, KZ5AA, Quarry Heights.
China: K. L. Koo, P.O. Box 409, Shanghai.
Chile: Luis M. Desmaras, Casilla 761, Santiago.
Colombia: L.C.R.A., P.O. Box 1266, Bogota.
Costa Rica: F. Gonzalez, Box 365, San Jose.
Cuba: James D. Bourne, Lealtad 660, Habana.
Czechoslovakia: C.A.V., Vaclavske Nam 3, Prague II.
Denmark: E.D.R., Box 79, Copenhagen K.
Eire: R. Mooney, Aughnacloy, Killiney, Co. Dublin.
Finland: Tatu Kolehmainen, Kasarminkatu 25.C.12, Helsinki.
France: R.E.F., I Rue des Tanneries, Paris 13°.
Germany: (D2 calls only) Capt. J. Blackwood, R. Signals, P. & T. Section, HQ. Mil. Govt., Hamburg, BAOR.
Germany: (D4 calls only) Signal Division, HQ. USFET, APO 757, c/o Postmaster, New York, N. Y.
Greece: C. Tavaniotis, 17-a Bucharest St., Athens.
Great Britain: A. Milne, 29 Kechill Gardens, Hayes, Bromley, Kent.
Guam: Box 30, Staff Com. Marianas, c/o FPO, San Francisco.
Guatemala: W. P. Boyer, c/o PAA Communications, Guatemala City.
Italy: A.R.I., Viale Bianca Maria 24, Milan.
Luxembourg: W. Berger, 20, Louvigny St., Luxembourg.
Mexico: L.M.R.E., Av. Juarez 104-22, Mexico, D.F.
Morocco: C. Grangier, Box, 50, Casablanca.
Netherlands: V.E.R.O.N., Postbox 400, Rotterdam.
Newfoundland: N.A.R.A., Box 660, St. Johns.
New Zealand: N.Z.A.R.T., P.O. Box 489, Wellington C-1.
Nicaragua: R. Argenal, P.O. Box 78, Managua.
Norway: N.R.R.L., P.O. Box 898, Oslo.
Panama: R. D. Prescott, P.O. Box 32, Panama City.
Paraguay: R.C.P., Palma 310, Asuncion.
Peru: Radio Club Peruano, Box 538, Lima
Philippine Islands: G. L. Rickard, 48 Ortega, San Juan, Rizal.
Porto Rico: E. W. Mayer, P.O. Box 1061, San Juan.
Salvador: J. F. Mejia, 7a Calle Poniente No. 76, San Salvador.
South Africa: S.A.R.R.L., P.O. Box 7028, Johannesburg.
Sweden: S.S.A., Stockholm 8.
Switzerland: U.S.K.A., Postbox, Berne.
Uruguay: R.C.U., Casilla 37, Montevideo.
U.S.S.R.: Central Radio Club, Postbox N-88, Moscow.
Venezuela: R.C.V., Apartado 1247, Caracas.

Following usual custom, the May and October issues of *QST* each year will carry the above list, with revisions and additions as necessary.

U.S.S.R.

We've been hearing U and UA stations in increasing numbers recently, so it was not a surprise to learn that the Central Radio Club is again active, with address still Postbox N-88, Moscow. Individual chapters are being formed in the larger cities, with each group operating a club station. The following bands have been allocated: 1715-2000 kc., 7000-7200 kc., 14,000-14,400 kc., 21,100-21,500 kc., 28,000-29,700 kc.

Authorized power depends upon operator competency. Holders of a first-class license may have 100 watts output; second-class privileges include 20 watts output; and third-class, 5 watts output.

The society's magazine seems to be going strong; we only wish we could read it! Ernst Krenkel, chairman of the Central Club, expects a bright future for amateur radio in his country.

PORTUGAL

A second country heard from for the first time since the war is Portugal, with the R.E.P. reporting it is again fully active. At a recent Council meeting, the following officers were elected: president, Manoel C. V. Antunes, CT1CO; vice-president, Jaime V. dos Santos, CT1QA; first secretary, Pedro C. Martinho, CT1AG; second secretary, Alberto R. dos Santos, CT1QF; treasurer, Tomaz C. de Fuigueiredo, CT1KN.

The Portuguese government has not yet authorized postwar amateur operation, but the Society expects release of frequencies and reinstatement of licenses soon. No information is available about licenses for newcomers.

FRANCE

Supplementing an item in a previous issue, we now report that French amateurs were given the 40-meter channels of 7150-7200 kc., power input of 50 watts, in addition to half the 20-meter band as in other countries. The top limit of the 40-meter assignment may be indicative of the French government's attitude at the coming world conference, in not wishing to permit amateur operation on the channels 7200-7300.

American servicemen-hams in France are being licensed for amateur operation, with operator tickets issued by the Chief Signal Officer and station authorizations by the French Minister of the P.T.T. Call signs will be issued in the block F7AA-F7ZZ. That regulations will be similar to those in Germany is indicated by the fact that Lt. Ralph Dage, W8PHZ-D4ADX, amateur radio officer in the U. S. zone of Germany, journeyed to Paris to set up the licensing procedures.

• Technical Topics —

Impedance Matching with an Antenna Tuner

The link-coupled antenna tuner shown in Fig. 1 is a useful device because it not only provides needed selectivity for preventing transfer of harmonics to the antenna but offers a means for obtaining symmetrical coupling between a single-ended tank circuit and a balanced feeder system. It is also commonly regarded as a means for matching the impedance of the feeder to the required transmitter load, the theory being that the load is adjusted by changing the spread between the feeder taps on L_2 and the coupling between either or both of the two tank coils and their associated link coils, L_3 and L_4. When the transmission line is matched to the antenna so that the standing-wave ratio is near unity — that is, when the line is flat — the matching is relatively simple. However, it doesn't always work out so nicely when a resonant line is used. On occasions it proves to be difficult, if not impossible, to load up the final stage; tuning is sluggish; part or all of the antenna tank coil, L_2, heats; and results generally are unsatisfactory.

It is common knowledge that a transmission line terminated in a resistive load equal to its characteristic impedance can be any length and the impedance looking into the sending end always will be a pure resistance equal to the line impedance. But if the load has any other value the impedance looking into the sending end will be complex — that is, it will have both resistive and reactive components. The magnitudes of both components will depend upon the electrical length of the line, the characteristics of the load, and the characteristic impedance of the line itself. Matching the transmitter to the input end of such a line entails two separate operations: (1) "tuning out" the input reactance by supplying

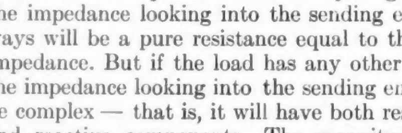


Fig. 1 — The link-coupled "universal" antenna coupler.

an equal amount of reactance of the opposite kind, and (2) adjusting the coupling so that the desired power is transferred to the resulting purely-resistive component of the line's input impedance.

In the coupling circuit of Fig. 1, a resistive load readily can be matched to the transmitter by changing the spread between the taps on L_2. When the line has reactance as well as resistance the reactive component is reflected across the whole tank in proportion to the ratio of the impedance, as measured across the ends of the tank, to the impedance of the load between the taps. Since the taps generally are not at the extreme ends of L_2, the reactance reflected across the tank as a whole is usually higher than the reactance of the line. The reflected reactance is equivalent to an inductance or capacitance (depending upon whether the line is inductive or capacitive) shunting the whole circuit. The circuit is consequently detuned, and C_2 is supposed to be readjusted to resonate it.

To a limited extent, this scheme for tuning out the line reactance will work quite satisfactorily. It is at its best when the reactive component of

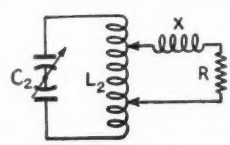


Fig. 2 — **Except at voltage and current nodes, the input impedance of a transmission line with standing waves can be represented by a reactance in series with a resistance. In this drawing the reactance, X, is assumed to be inductive.**

the line's input impedance is small compared to the resistive component. However, when the line reactance is comparable to or larger than the resistance, the circuit is at a disadvantage because it is inherently incapable of making the line itself "look like" a resistance. As an example, suppose that in Fig. 2 X and R in series represent the input impedance of the line, X being the inductive reactance and R the resistance, and that X is five times as large as R. (This is by no means an extreme case.) The line impedance, Z, is equal to $\sqrt{X^2 + R^2}$, or 5.1 times the resistance. In order to supply a given amount of power to R we need a definite value of current through it, and this in turn means that there will be a definite voltage drop across R. But to get the desired current through R it is necessary to supply 5.1 times as much voltage to X and R in series as R alone requires.

The only way to get the larger voltage is to use more spread between the taps on L_2 than would be necessary if the circuit were working into R alone as a load. But as the taps are moved farther apart the reactance reflected across the tank decreases. In the example of Fig. 2, moving the taps apart would be equivalent to shunting L_2 with a coil of increasingly smaller inductance.

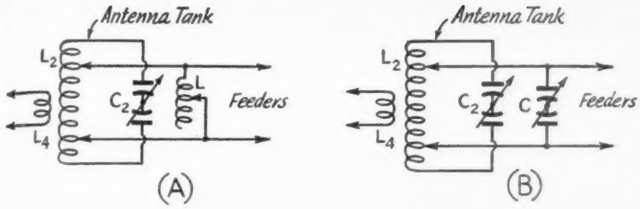


Fig. 3 **— Compensating reactances connected across the input terminals of the transmission line to tune out the line reactance. When a condenser, *C*, is required it need not be the balanced type shown, particularly when the larger values of capacitance are needed. However, the balanced type is preferable for maintaining symmetry.**

Consequently, reresonating the circuit in such a case requires increasingly larger values of capacitance at C_2, and it is not unusual to find cases where the resonance point is thrown completely off the condenser scale. If additional shunting capacitance is used and a working adjustment finally achieved, the common result is that the L/C ratio is so low that the circulating current becomes undesirably high and the sections of L_2 between the taps and the outer ends get hot. The inner section may remain cool, since the current is divided between it and the line. When the line reactance is capacitive rather than inductive the story is much the same, except that in that case it may be necessary to operate C_2 at minimum capacitance and reduce the inductance of L_2 until it is possible to find resonance.

When difficulties of this sort are encountered normal operation can be restored by confining the function of the taps on L_2 to matching to the *resistive* component of the feeder input impedance and making the reactance cancellation a separate operation. The process is simple and has the single disadvantage that an additional coil or condenser is required. The problem, if it can be called such, of tuning out the reactance component is simply that of shunting an appropriate amount of reactance, but of the opposite kind, across the input terminals of the line. It isn't necessary to make any calculations; the whole thing can be done by a simple cut-and-try process. Fig. 3 shows the circuits, A being for the case where the feeder has capacitive reactance, B for a feeder showing inductive reactance at its input end.

To tune up the system, first disconnect the feeder taps from L_2, loosen the coupling as much as possible, and tune C_2 to resonance as indicated by a kick in the current of the plate tank, L_1C_1 being adjusted for minimum plate current as usual. In effect, L_2C_2 is being used as a wavemeter and the plate-current kick should be quite small. There is considerable danger here of using too much coupling, which will show up as a reaction on the tuning of the amplifier tank. The coupling should be so loose that C_1 does not require readjustment for minimum plate current when C_2 is brought to resonance. Note the resonance setting on C_2's dial.

Next, tap the feeders on L_2, using a small number of turns for a starter. Retune C_2 to determine whether more or less capacitance is required to bring the circuit to resonance. If the capacitance must be *increased* the feeders are inductive and a compensating condenser, Fig. 3-B, must be used; if *less* capacitance is required at C_2 the feeders are capacitive and Fig. 3-A applies. Let us assume that a compensating condenser, C, is required. Connect it as shown, reset C_2 to the resonance point determined without the feeders connected, and adjust C until the whole system is resonant as indicated by the kick in final plate current. It should now be possible to connect or disconnect the feeders from L_2 without changing the tuning of the L_2C_2 circuit. That's all there is to tuning out the feeder reactance. In case an inductance, L, is required, the process is the same, the most convenient arrangement being a coil that can be tapped at every turn.

The next step is to match the resistive component of the line to the transmitter. As the spread between taps is increased, the load on L_2C_2 becomes greater and the resulting decrease in the Q of the circuit makes it necessary to use closer coupling between L_1C_1 and L_2C_2. It should be possible to find several combinations of tap spread and coupling that will load the final amplifier to rated plate current. However, it is advisable to use that combination that gives the proper loading with relatively loose coupling, since loose coupling means less harmonic transfer. When the coupler is working properly, detuning C_2 to either side of resonance should cause the final plate current to decrease — a distinctly advantageous feature of this type of antenna tuner in that accidental detuning in the antenna system will not overload the amplifier.

How much L or C will be required depends on the line length, the characteristic impedance of the line, and the standing-wave ratio. In general, excessively large condensers or coils will not be necessary. The worst cases in this respect occur at certain line lengths with high standing-wave ratios and low-impedance feeders. Fig. 4 gives the minimum required shunt reactance in terms of a factor to be applied to the characteristic impedance of the line. For example, if the standing-wave ratio is 10-to-1 on a 600-ohm line the minimum reactance required for the worst case is $0.22 \times 600 - 132$ ohms, or if the standing-wave ratio is 2-to-1 on a 70-ohm line the minimum reactance required is $1.05 \times 70 = 73.5$ ohms. The latter case corresponds to a condenser of about 500 $\mu\mu$fd. at 4 Mc., and considering the ways in

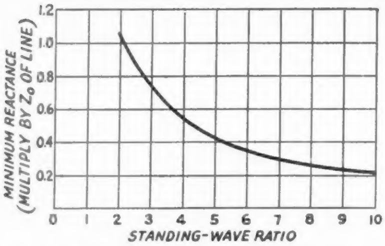


Fig. 4 — Minimum values of reactance required by the circuits of Fig. 3 as a function of standing-wave ratio and line characteristic impedance. For any particular frequency the reactance may be converted into inductance or capacitance by the formulas or charts given in the ARRL ***Handbook***. With standing-wave ratios higher than 10, the minimum reactance required is very nearly equal to twice the characteristic impedance of the line divided by the standing-wave ratio.

which high- and low-impedance lines are used it does not seem likely that a larger condenser would ordinarily be needed. In most cases much smaller values will be called for. Very high values of shunt reactance need not be used (that is, very large coils or very small condensers) because in such cases the reactive component of the line's input impedance is small and the ordinary coupler alone is capable of handling the situation.

The compensating reactance need not be used, of course, unless poor performance of the coupler by itself requires it. When it *is* used, it is generally not necessary to readjust it for working through a band, provided it is adjusted for a frequency near the center. Minor departures from the pure-resistance load condition can be taken care of by C_2. There may be exceptions to this in the case of long lines with high standing-wave ratios, but usually the reactance can be set at a median value for each band and left alone.

— *G. G.*

Amateur F.M.

Some new things have to simmer a while before really starting to cook — or maybe there has to be a really pressing need before Old Man Inertia gives way. Whatever the reason, there is evidence that interest in f.m. is on the increase. In contrast, the few years immediately preceding the close-down saw a lot of material in *QST* on the principles of f.m. and its advantages and application in amateur work, but for all the enthusiasm it stirred up the space seemingly could have been used to better advantage.

In the metropolitan areas f.m. is working itself in through the back door. When there are hundreds of broadcast receivers within a stone's throw of a ham transmitter it's no fun trying to operate with amplitude modulation, particularly during the evening hours. Fellows in that situation have found that f.m. gives them the means for operating 'phone without becoming the neighborhood scourge, since with f.m. the stuff picked up in the audio system of a bum superhet doesn't come out as recognizable interference the way a.m. does. It can't, because ordinary rectification of an f.m. signal simply produces an unvarying d.c. voltage that does not go through an audio amplifier.

Most of the present interest in f.m. is on 28 Mc. Since there are very few 28-Mc. f.m. receivers extant in ham stations, reception is of necessity on regular communication receivers. The inherent advantages of f.m. in the suppression of noise cannot be realized to any extent by such makeshift reception, but that isn't the real point — reduction of BCI is what counts currently. In any event, quite good reproduction of the modulation on the incoming signal can be secured by detuning the receiver so that the carrier falls on a fairly straight portion of the sloping side of the i.f. selectivity curve. The only requirement is that the transmitter's frequency swing must be kept within sufficiently narrow bounds so that the limits of linearity in detection by this method are not exceeded. This means that the deviation ratio should be 1 or less at the highest modulating frequency. In itself this is advantageous because it simplifies the problem of modulation and actually can result in a better signal-to-noise ratio on weak signals than is possible with wide-band f.m.[1]

Anticipating the future a little, it seems quite obvious that if f.m. provides a real solution to the BCI problem in the present 28-Mc. assignment there is going to be a growing feeling that it should be extended to all parts of the band where a.m. is permitted — and possibly to lower-frequency bands as well. As for the latter, the same advantages as to BCI will hold for the same type of pick-up, naturally. R.f. pick-up in the audio system of the broadcast receiver probably is considerable at 14 Mc. and may be appreciable at 4 Mc. if the receiver is close enough to the transmitter. On the lower frequencies, however, the interference more commonly is of the tunable type, where the signal is picked up in the receiver's front end and mixes with an oscillator harmonic to produce the intermediate frequency. The chances are that there is little to choose between f.m. and a.m. in such cases, because the f.m. signal will be detected if the carrier falls on the slope of the i.f. curve — exactly the method that is presently being used for 28-Mc. f.m. reception.

[1] Crosby, "Band-Width and Readability in Frequency Modulation," *QST*, March, 1941.
Grammer, "Some Thoughts on Amateur F.M. Reception," *QST*, March, 1941.

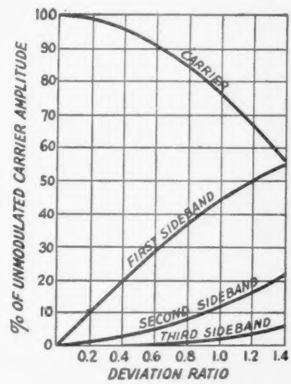
Until now we have avoided any attempt to set standards for amateur f.m. transmission because its use has been largely experimental and has been confined to portions of bands not ordinarily used for a.m. But should f.m. invade a.m. territory the establishment of standards becomes necessary immediately, and it seems to us that the only possible standard is that no sideband of significant amplitude should fall outside the channel occupied by an a.m. transmission having the same upper limit of audio frequency. Such a standard should be fair enough to all concerned.

The question then becomes this: What deviation ratio is permissible if such a standard is to be met? From the nature of frequency modulation it is apparent that the maximum frequency deviation cannot be greater than the highest audio frequency in the modulation, because any larger deviation than that would go outside the limits of the a.m. sidebands. However, there is more than that to consider. A frequency-modulated signal can be resolved into a carrier and a series of sideband pairs, each pair being spaced nf above and below the carrier frequency, where n is any integer and f is the audio modulating frequency. At *any* frequency deviation, however small, there is an infinite number of these sideband pairs, so the theoretical spectrum of a frequency-modulated signal is as wide as the radio-frequency spectrum. In amplitude modulation, in contrast, there is only one pair of sidebands with a spacing of f above and below the carrier frequency. At 100-per-cent modulation these sidebands also have an amplitude of one half the carrier amplitude. In the frequency-modulated signal the first pair of sidebands also appears at a frequency f above and below the carrier ($n = 1$), and if the channel occupied is to be no wider than the a.m. channel the amplitude of any sidebands above the first pair must be insignificant.

The amplitude of an f.m. sideband varies with the deviation ratio as shown in Fig. 1.[2] With a deviation ratio of 1, the amplitude of the second sideband ($2f$ above and below the carrier frequency) is about 12 per cent of the unmodulated carrier amplitude and the third sideband is only 1 per cent of the carrier. The second sideband is thus about 19 db. below the unmodulated carrier and the third is 40 db. down. At this point the amplitude of the first sideband is very nearly the same as the sideband amplitude in a 100-per-cent-modulated a.m. signal. Thus insofar as the first sideband is concerned, the f.m. signal will have just about the same power to cause interference as an a.m. signal. The second sideband, although not completely negligible, is far enough down so that its possibilities for causing interference are not too serious. The third sideband, of course, is too far down to warrant any consideration.

If the deviation ratio is reduced to 0.5 the amplitude of the second sideband drops to under 5 per cent of the unmodulated carrier (30 db. down) and the first sideband has about 25 per cent of the carrier amplitude. With this deviation ratio the second sideband is practically negligible and the first sideband will cause less interference than the corresponding a.m. sideband. Although the smaller amplitude of the first sideband means less modulating energy in the signal, the peculiarities of f.m. reception are such that this is not ordinarily nearly so important as the effect of a similar reduction in sideband power in amplitude modulation. It seems reasonable, then, to conclude that although f.m. definitely does not take less spectrum *space* than a.m., it may actually cause less *interference* (to a.m. reception) than an a.m. signal if the deviation ratio is kept below 1. Actual listening tests confirm this; with a single-tone modulating signal it is difficult to detect the second sideband on a crystal filter receiver used as a "spectrum analyzer" until the deviation ratio gets up toward 1. With the deviation ratio in the vicinity of 0.5 to 0.6, anything beyond the first sideband pair is undetectable even with an extremely strong carrier. Under these conditions the power in the first sideband is down 5 to 6 db. as compared to 100-per-cent amplitude modulation.

Fig. 1 — Variation of carrier and sideband amplitude with frequency deviation in frequency modulation.



It looks as though it should be possible, in view of the above, for a.m. and f.m. to live together. It will be necessary, obviously, for the operator of the f.m. transmitter to take steps to see that his deviation ratio does not become high enough to bring the extra sidebands up to appreciable amplitude. Practically, this means that the maximum deviation should not exceed 2 to 3 kc. at the carrier frequency. A method for checking deviation was described some time ago in *QST*[3], and by making use of an accurately-known audio frequency, such as the modulation carried by the WWV transmissions, it is possible to make a quite good measurement. A small 'scope hooked across the speech amplifier will

[2] Data taken from Hund, *Frequency Modulation*, McGraw-Hill Book Co., New York City.

[3] Grammer, "Getting on 56-Mc. F.M.," *QST*, June, 1940.

provide a continuous check on the voice amplitude, which in turn determines the deviation. Even a magic-eye indicator might do the trick.

With a reactance modulator some such measuring means is a necessity. However, automatic protection can be obtained by using a modulating system which inherently is incapable of too much deviation. The circuit shown in Fig. 2 appears to fill this order. Developed and patented by Hammarlund engineers some years ago for an amateur transmitter which was just in the final stages when the war broke out, it uses a reactance modulator operating on a crystal oscillator. The frequency deviation obtainable depends upon the crystal cut; at 3.5 Mc. it is possible to secure a total swing of 2500 cycles with a Y-cut crystal and 1000 cycles with an X cut. Of greater interest, however, is the fact that a swing of 400 cycles (200-cycle deviation) can be obtained with the AT-cut crystals now so widely used; when multiplied up to 28 Mc. this comes out to be a deviation ratio somewhat over 0.5, based on an upper limit of 3000 cycles for speech. The value of R_1 may have to be varied somewhat with different crystals, and in any event the voice amplitude must be kept below the point that causes the crystal to drop out of oscillation. No audio power is required to drive it, the 6V6 modulator being a Class A amplifier running at normal ratings. An input signal of 15 volts peak amplitude should be ample. As an interesting sidelight, the circuit was not dormant during the war period; it was used by OWI for simultaneous frequency-shift keying of their short-wave broadcast transmitters by shifting the d.c. bias on the modulator!

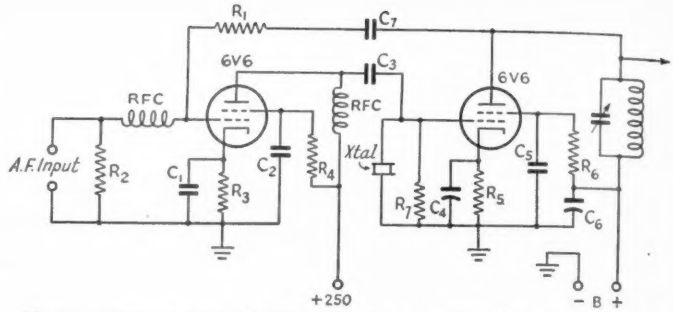


Fig. 2 — Reactance modulation of a crystal oscillator. The oscillator itself is conventional and may be operated at the normal voltages, with tank-circuit constants suitable for the frequency. AT-cut 3.5-Mc. crystals are recommended for 28-Mc. output.

C_1, C_2, C_5 — 0.001-μfd. mica.
C_3 — 1000-μμfd. mica.
C_7 — 5.5-μμfd. (fixed mica or 3–30 ceramic trimmer).
C_4, C_6 — 0.01-μfd. paper.
R_1 — 0.5 megohm, 5 watts.
R_2 — 0.5 megohm, ½ watt.
R_3, R_5 — 400 ohms, 1 watt.
R_4, R_6 — 25,000 ohms, 1 watt.
R_7 — 5000 ohms, ½ watt.
RFC — 2.5-mh. r.f. choke.

If f.m. transmission is going to catch on, the next step will be to incorporate modifications in receivers to take advantage of the noise reduction that f.m. makes possible. Something more satisfactory than tuning an a.m. receiver off resonance is called for. But that is another story.

— *G. G.*

A.R.R.L. CONVENTIONS

VERMONT STATE
(New England Division)
Burlington, Vt., October 5th

The first postwar annual Vermont State ARRL Convention, sponsored by the Burlington Amateur Radio Club, will be held at the Hotel Vermont, Burlington, on Saturday, October 5, 1946. Speakers, exhibits; 'phone, traffic and emergency meetings; ARRL club code award and quiz contests; dancing; Vermont turkey dinner with all the fixings. Registration fee, $2; with XYL, $3.75. Write: Burtis W. Dean, W1NLO, P. O. Box 81, Burlington, Vt.

MIDWEST DIVISION
Topeka, Kansas, October 5th–6th

The first postwar ARRL Midwest Division Convention will be held October 5th and 6th under the sponsorship of the Kaw Valley Radio Club, at the Hotel Jayhawk, Topeka, Kansas. Numerous speakers and demonstrations highlight the program, plus a buffet supper Saturday evening and grand banquet and prize drawing Sunday. Advance registration and hotel reservations are urgently requested, with a special prize drawing being held for advance registrants. Write S. D. Thacher, 522 Jackson, Topeka, Kansas. Registration, $6.00.

NEW HAMPSHIRE STATE
(New England Division)
Manchester, N. H., October 26th

The Manchester Radio Club is working hard to make the "best ever" New Hampshire State ARRL Convention in their city, October 26th, at the Hotel Carpenter. Full program planned, including speaker from ARRL Hq. Registration $4.25, but $4 before September 30th by writing Henry Izart, W1AUY, Box 98, Mast Road, Manchester, N. H. Make your reservations early!

How's DX?

How:

The guy who owes Jeeves all that back salary and wears the suit that Jeeves doesn't keep pressed must confess to more than the normal amount of naïveté. For many years he has been of the impression that the DX gang is 100 per cent a swell bunch of guys, the salt of the earth, ipsy-pipsy Yankee Doodle boys — and the few instances of bad practices that have shown up have been blamed on newcomers to the game who don't understand the rules. Why a guy like that hasn't a basement full of gold bricks and Brooklyn Bridges is one of the mysteries of life, but it is becoming more and more apparent that we have in our midst a small group of self-conscious, deliberate, Grade A stinkers who flagrantly violate the rules every time they think it will give them a slight advantage. This isn't just our own private opinion, as indicated by the number of letters received over the last month from guys who play the game clean and are burned up about those who don't. Let's list the cute practices of some of these darlings that we choose to call "DX hogs," just for the record. The number-one complaint is about the guys who sneak outside the band to call some DX. Even when they get called on it by someone and are told they are out they ignore the warning, so the only possible conclusion is that the aberrations are deliberate. Mind you, we aren't talking about the guys whose enthusiasm carries them out once and when they discover it they scurry back inside and don't dare go within 20 kc. of the edge for days, but about the DX hogs who do it intentionally over a long period of time. Then there is the number-two complaint, about the guy who stretches a QSO until the DX fades out and no one else can get a crack at it. Naturally there is no objection to a good DX rag-chew — sometimes we think there should be lots more of them — but they shouldn't be with one- or two-station countries until the masses have had a fair crack at that country. And there is the DX hog who, when he spots a DX station calling CQ, tunes up smack on the weak one in the hope that no one else will hear it and he will thus stand a better chance. When he gets called on this practice, such a DX hog invariably claims that he was getting everything lined up "on the nose" in preparation for his call, which is so much malarkey, obviously, since he could tune up 5 or 10 kc. away and his antenna ammeter would never know the difference when he eased over, and any rig that takes that long to tune up should be junked anyway.

That's enough to give you the general idea. Naturally no one who might see this will have been guilty of any of these practices, so we suggest that he clip out the above paragraph and send it to the several fellows he undoubtedly knows who are violators.

Lots of the stuff that goes on we blame on the receiving habits of the DX stations. One prize example is this business of calling the DX on its own frequency, for two minutes or so, in the hope that you'll outlast your rivals. The result is that the DX is covered up unless it comes back to the guy with the longest call, and by that time the others are calling again. The consequence is QRM galore on the DX and three or four minutes between ending a CQ and replying to a call. The sooner the DX stations get wise to *not answering* calls on their own frequency, the sooner they will speed up their contacts-per-hour. When they use LM, ML, HM and MH to indicate how they're tuning, they'll see their contacts-per-hour go up in a hurry. For example, UA3AW is just one guy who has control of the situation all of the time. And those long CQs by the DX! There are plenty of stations in this country who can hear two wires scratched together in Tibet or Niue, and those long CQs just waste time. Sure, we know, it's a swell feeling to find the whole band calling you, but it doesn't pay off in more contacts.

So let's all take a look at our operating, Ws and DX alike, and polish off some of those rough

edges. Who knows? We may end up with something that's a lot of fun — for everybody.

When:

Not much on 80 this month, except a note from W8NSR to say that he and a bunch of W2, W3, W8 and W9 were heard by ZL419 back in May, and W1OKU reports a contact with **KS4AA** (3690), who claimed to be on Swan Island. Could be, but "Jeeves, pass the salt!" The prefix is strictly from hunger, not the FCC ·–·–·– W5LDH raised KZ5AD and VO3O on the low-frequency band.

On 40, W1JJL got S9 reports from **HH2FE** (7055), **F3KH** (7148), **CM8DL** (7140) and **CM2BU** (7210). He puts question marks after **AO6E** (7142) and **TIMR** (7155), quite justifiably ·–·–·– W5LDH worked FM8AC on 40, and W8PMJ grabbed off **VK7DS** (7180) ·–·–·– At W5LIU it was **ZL2PM** (7190), **J2AAF** (7180) and **VE8AS** (7175), on 25 watts.

There is lots of stuff on 10 these days, although too many guys are keeping mum about it. But W8PMJ passes along **CR7AD** (28,020), **ZE1JJ** (28,200) and **CX4CZ** (28,000), and W2KIK adds **VQ2FR** (28,350), **ZL1MQ** (28,300), **HK3DD** (28,060), **OQ5AE** (28,290), **CE1AH** (28,250), **PY1DE** (28,255), **KZ5AB** (28,120 T9), **CX2CK** (28,620), **VP6MR** (28,280), **ZS1BD** (28,340), **ZS6FU** (28,080) and **F8TU** (28,450) ·–·–·– W5LDH adds OA4F, OA4AI, LU2DM, LU5CZ, YV5AN, and CX5AY to the argument for 10, and W8TOB makes it **ZS1T**, YN1RA, VP6LN, HK3DD and KA1AW/MM ·–·–·– To clinch the whole thing, W5KUC lists VP4TK, VR2AB, VP3F, TG9LP and VP9F worked.

For all the DX-jaded lads who have lost their interest because there is no new stuff on these days, we have fellows like W6KIP reviving their interest by mentioning **VU2AK** (14,085), **ZK1AB** (14,125), **K6HOT/KC6** (14,100) on Canton, **VP8AD** (14,085), **PK6HA** (14,060) and **W6VDG/KW6** (14,170) on Wake. Alex says if you call VS7ES long enough, VS7AX will take pity on you and come back, on the same frequency. At least that's how KIP got 7AX! ·–·–·– And if you've been hearing rumors of the West Coast working **AC4YN** (14,135), you have been hearing aright! W6VFR, ex-W9ANS, turned the trick one night at 0300 GCT and so breaks into the very select society of the TWA ·–·–·– W5ASG brought his postwar total to 65 and his all-time to 122 with stuff like **ZP8CN** (14,085), **CP5EL** (14,075), **ZD8A** (14,075), **FM8AC** (28,050), **W6VKV/I6** (14,080) in Eritrea, **PK6TC** (14,060), **VS1BX** (14,085), **ZC4NX** (14,080), **VP8LK** (28,000 T6), **K7JFE/KG6** (14,120), **W2LFI/FF8** (14,375 f) in Dakar, **CR9AN** (14,055) and **J9AND** (28,500 f). Bill heard **PK1RI** (14,050), **EL3A** (14,080), **UA0KA** (14,085) and **VQ8AE** (14,090) ·–·–·– W4BPD, who struggles along with only three rhombics and two Sterba curtains, managed to get a fair portion of the *Call Book* into his log. Here are a few: **PZ1FM** (14,170), **VK4OS** (14,150) in Papua, **W6JIM/C1** (14,190), **OE1XBC** (14,075), **EK4AZ** (14,340), **VS7AX** (14,025), **LZ1XX** (14,090), **C3YW** (14,090), **J9ABF** (14,110), **PK6AW** (14,340 f), **M1YS/VU2** (14,070), **ZP6AB** (14,035), **UA9CB** (14,070), **PK5JN** (14,100), **W9CAC/TF** (14,200 f), **HH3L** (14,080), and **OE3WD** (14,085). He missed **YS1X** (14,100), **SP2RD** (14,080), **KA1AK** (14,115), **XU8NR** (14,020) and **OX1A** (14,150 f). Gus worked VS4JS on JS' last day in Borneo, so there goes your North Borneo contact unless something else turns up ·–·–·– W7EYS kept busy with **ON4PW** (14,060), **CX1DZ** (14,075), **PA0NG** (14,060) and **G8UY** (14,075), with **VS1QB** (14,090), **I1KN** (14,080), **CR9AG** (14,060) and **XU1MB** (14,150 f) in the heard column. Bob says the Africans should dig a little deeper around 2400 GCT for W6 and W7. Also he is quite conversant with the high type of operating on the band. For example, he heard LU9AX work a W2, a W9 in Chicago and a VE7 on three successive calls of "CQ Dakota only," and his own "CQ QSP I7" added two new states for WAS before he got what he wanted! ·–·–·– W4BRB has all the makings of a good DX man. He grouses about a lousy location, how the guys in other districts have a better crack at the stuff, never has enough power or enough antennas, and in between times works **CN8AB** (14,090), **ZC1AR** (14,080), **UA3CA** (14,070), **VP4TD** (14,090), **UA3AW** (14,095), **TI2MAR** (7150 T5), **W1DTS/CT2** (7155) and **SU1US** (14,140). He missed **OX3BB** (14,075), **EZ4X** (14,045), **PK6UA** (14,065), **VP2AT** (14,040), **OQ5LL** (14,085), **SV1AZ** (14,055), **YI3CE** (14,055) and **VQ4CRB** (14,020). Gene likes 40 for Europe but says there aren't enough of them on. From W1DTS/CT2 he heard that the ZS and VQ gang is on the low end of 80 between 0600 and 0800 GCT looking for Ws. Any takers? ·–·–·– W6PBV managed to keep his hand in by snagging **OZ7UU** (14,090), **SM5OV** (14,045), **ON4WY** (14,080), **OK1FF** (14,080), **W5HHO/J2** (14,160), **XU1YK** (14,190) and **W3BKU/J9** (14,085) in Okinawa, while WØNCS was busy with **OZ3HR**(14,080), **CX1CX** (14,085), **W1DTS/CT2** (14,120). **VO1G** (14,080), **TI2FG** (14,040), **XSM6UC** (14,090) a ship in the Baltic, **ZS5U** (14,130) and **W4FGW/J2** (14,080) ·–·–·– W9VDA scared up **VQ2GW** (14,090), and W1KFV added **UA3DA** (14,030), **YR5C** (14,060) and **TF5Z** (14,030). Bob suggests times of QSOs instead of frequencies as being more useful information, which is OK with us if you guys want it that way and will pass along the dope ·–·–·– W5IOA in New Mexico likes the improvement his 200 watts appears to be over the previous 10 watts, but we imagine his next 13 db. will come a little harder. Anyhow, Mac latched on to **OZ3J** (14,035), **W8WHW/KG6** (14,130), **VP7N** (14,005), **J2ABC** (14,100) and **G2HD**

(14,085) · – · – · – At W8PMJ it was **VK7LJ** (14,125), **ZE1JU** (14,150) and **VE8MR** (14,150) at Resolution Island; and W1KMY added **YR5X** (14,050), **LA2UA** (14,175), **UA3BH** (14,080), **CN8MZ** (14,120) and a little gem calling himself YO5WZ, who drifts 40 kc. during transmissions · – · – · – G6RH has a nice list of stuff heard or worked, the cream of which includes **ET3Y** (14,090), **VS9AN** (14,140), **PZ1A** (14,310 f), **CR6AM** (14,250 f), **AC3SS** (14,300 f, 14,200 cw), **W3JLW/KH6** (14,120), **FK8OSL** (14,120), **YI2CA** (28,200 f), **LX1BG** (7090 f) and **GC3GS** (7250 f). Bob reminds us that we never told where that OY4C was who cropped up before the war. For those who have been wondering, he was undercover in — of all places — Germany! You may recall that he had QSL cards but no QTH on them.

The 'phone contingent is represented this month by a small but select group. For example, W1HKK is up to 78 postwar on 'phone with **W5IBE/J5** (14,170), **J9AAR** (14,240), **W2CDJ/J3** (14,340), **W6QEE/J9** (14,250), **VU8GA** (14,055) and **W9HJW/Saipan** (14,190). Dana was having trouble with the neighbors, but from the looks of his list, those neighbors now won't come within a half mile of his whirling rotary! He says W1HMH heard **AC4YN** (14,080) and **FN2A** (14,130)! · – · – · – W2MPA has a very long list, including **ZP2AC** (14,365), **PZ1GB** (14,280), **W8QEN/CT2** (14,310), **HC1FE** (14,080), **I1MT** (14,070), **VK6HL** (14,140), **W9NLF/J9** (14,225) in the Marshalls, **W8CHT/J7** (14,180) at Hokioto, **XAAP** (14,340) in Greece, **LH2A** (14,100) in Trondheim, Norway, **LX1AX** (14,330) and **VP7NF** (14,335), and Ted heard **AC3SS** (14,300 and 14,170) · – · – · – W6ITH also got some good ones, like **D4OOU** (14,350), **VS1BV** (14,270), **D4ACR** (14,310), **G2PU** (14,150), **VR2JI** (14,260), **K6SCJ/KP6** (14,250), **PK1AM** (14,165), **VS2BF** (14,150) and **YN1LB** (14,020).

Where:

Let's run over the QSL business in a hurry, for the benefit of some of the newcomers to the DX racket. W cards for foreigners can go singly to a *Call Book* address, or in a bunch to a foreign QSL Bureau (see addresses in "Foreign News" in *QST* for forwarding). If you can't find an address or a QSL Bureau, send the card to ARRL Hq. and we'll try to forward it for you. To receive your own cards, be sure to have a self-addressed stamped envelope at your QSL Manager's (see any *QST* for addresses). Cards for GIs overseas using their own calls with a portable suffix are being sent to the district QSL Manager. For example, cards for W9HJW/Saipan that come through ARRL Hq. are sent to W9HLF, the W9 QSL Manager, unless we are notified otherwise, and HLF holds them for HJW's envelope.

We have a few cards on hand that we can't forward because we've lost track of the addressee or we never did get his address. If you have any information on the following, please let us know so we can clean out our cards: Prewar EL2R, HI7GW, HP1X, PJ1BV, PJ3CO, PJ5EE, PZ6ZK and YN9G, and postwar EP1A, FA8B, HA4EA, TF1AA, TR1P, YR5W, ZA2X, 3A, X2CC, X2XX.

Speaking of QSL Managers, W1CH asks us to put in a plug for W1BGY, the W1 QSL Manager, and the swell service he gives the gang. We know that, but we'll go one better — we'll put in a word of praise for all of the QSL Managers, who have such a tough job and give of their time so willingly. The next time you send in your envelope and your hopes, tell the guy you appreciate what he's doing.

If you hear OK1AWX, it's OK1AW operating portable in the mountains, says W4ITR · – · – · – The QSL address of **VS7ES** (14,060) is Nr. 5 Elibank Road, Havelock Town, Colombo, Ceylon · – · – · – VP5AD, QSL Bureau for Jamaica, says VP5AR is a pirate, which is his polite designation for what we'd call a phony. The new *Call Book* gives the complete list of VP5 calls, with the exception of VP5JC · – · – · – Advance dope from the W.I.A. is that the VK Contest will be held during the first two weekends of November. We don't have the rules in time for this issue, but presumably they will be the same as other years · – · – · – W5ACL is a staunch champion of the underprivileged, and is firm in his belief that too many little fellows are letting the big guys override them with their modern plastic-and-chrome kilowatts. His cry is "Don't surrender to the California kilowatts and the six-element rotaries!" To show that he isn't giving up, he eases 200 watts into an old pair of 800s — remember them? — and comes up with all kinds of stuff. Myron says a card addressed "VK4OS, Port Moresby, New Guinea" is adequate · – · – · – QSL TA1DB via HB9U, and YR5X via HB9AG · – · – · – During recent contacts, W8HGW collected some addresses that may help: W6VKV/I6, A.P.O. 843, N.Y.C.; **ES5K** (14,090), Box 273, Parnu, Estonia; **EO4DC** (14,165), QSL care of W9RRT; **EK1AZ** (14,140), D. Crews, Box 57, British Post Office, Tangier Zone · – · – · – W1DTS/CT2 cards should go direct to W1DTS, 18 Veazie St., Oldtown, Maine, according to W9IHN · – · – · – That address we gave for W1KUY/MM a few months ago — care of Bob Evans, Balboa, C.Z. — was intended only for flight officers of PAA working in Central America. Your cards should go to C. B. Mould, W1KUY, Williamstown, Vermont.

Who:

W9VES/3 had access to 10 rhombics while in Washington, and he says with 100 watts he could really work some of the stuff. He worked some-

thing like 300 Gs, and a lot of other Europeans. Now he's back at Chicago and undoubtedly missing the rhombics — or building one! · – · – · – Last month we accused TG9PB of passing out "mass-production" contacts, because that was how it was told to us. We were called on it, and rightly so, because PB does not do as we claimed, but specifically states during his transmissions that the reports cannot be considered two-way contacts. The heard calls are not logged and thus no QSL card can be forthcoming. We're very glad to apologize, since our faith is completely restored · – · – · – W5LDD has the prize item this month. Now get this. There will be no more c.w. from TG. The government can't monitor it! Anyone volunteer for the job? Lou also says that W5 Little Dew Drops is now W5 Little Drool Drops, after meeting four YL student hams at W5GMG. If he gets tangled too much, he will be W5 Little Dead Duck · – · – · – Ex-D4AKO has a little about the D4s in Frankfort. D4ACD with only 40 watts and a 700-foot wire had over 50 countries on 10. AKO got up to 39 on 10 'phone with 500 watts and a three-element beam that had only two elements because he ran out of tubing · – · – · – W9FO of the *Call Book* gang ten years ago is now W1ONV in Hingham, Mass. VS9AN gave him his WAC from the new location · – · – · – W1FH has 114 countries — 83 on 'phone — postwar. W3BES has 111, W1CH is up to 104 with 150 watts, and W9FS has 93 · – · – · – Cards for EL4A should go to Cliff Evans, APO 605, PM, Miami, Fla. W2IOP takes care of the outgoing cards — Larry gets lists from the EL and shoots out the cards. EL4A is old W1BYG, has 31 countries from Liberia, and will be there for a year or more · – · – · – G6KS urgently wants New Mexico for WAS, according to G6KS. W5IOA is your man · – · – · – There are two active stations in Mhow, Central India: VU2AB and VU2AD. QSLs should go care of R.S.G.B. Other VU stations known to be active are VU2WP, VU2WM, VU2LR, VU2BC, and in Burma, XZ2DN, XZ2DA, XZ4AR and XZ4AQ · – · – · – W6WN was sorely tempted — but resisted, to his eternal credit — to sneak outside the band in an effort to raise **XU4B** (14,120) in Mongolia. Art says the guy gives his home address as 604 Gurley Avenue, Downey, Calif. · – · – · – It is not uncommon these days to hear DX men discussing the reasons for their not getting out as well as they used to. W1TS, a philosopher and DX man of the old school, is satisfied with his explanation. He admits that his antenna is made of old prewar copper wire, and he thinks the old copper is acting as a copper-oxide rectifier — it allows the signals to come in but nothing can go out! · – · – · – It always happens this way. W6TZB/K6 was up to 50 countries and still no WAC, Europe being tougher than somewhat from Hawaii. Finally, after several months of stalking, Bob snagged PAØNG for the sixth continent and, to clinch the deal, raised a G on his next CQ! · – · – · – W2MPA ate three orders of chop suey and came up with this thought-for-October: "This Month's Celestial Observation — DX stations transmitting on honorable rhombic and receiving on 2-meter 'J' should blow fuse!"

— *W1JPE*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W2EPM, Paul Pfeffer, Brooklyn, N. Y.
W2LXY, Emanuel B. Finkel, Elizabeth, N. J.
W3GWI, William R. Potter, Kensington, Md.
W4GBW, Ensign Roger M. Allen, Sumter, S. C.
W4VL, George E. Olson, sr., Columbia, S. C.
W5DZU, Andrew A. Ellis, Edmond, Okla.
W5KFR, William B. Gaydosik, Houston, Texas
W6MXC, Ralph E. Henry, San Gabriel, Calif.
W8FO, James W. B. Foley, Toledo, Ohio
W8UXP, James B. Joslin, Toledo, Ohio
W9PGT, Donald A. Spaulding, S1c, USNR, Chicago, Ill.
W9QI, Lawrence Barregarye, Springfield, Ill.
W3KRM, Lt.(jg) Frank J. Weiland, Washington, D. C.
GI5MZ, Wing Commander F. N. MacDowell, RAF

Strays

Aircraft receiver QRN, artificially created by metal planes in flight, is eliminated by the use of an Army-Navy wartime development, a dozen small whip dischargers trailing from the wing and tail surfaces of the plane. The whips are made of cotton rope-like material, 10 inches long, impregnated with a silver compound which affords a high-resistance unit. United Airlines is replacing trailing-wire tail-cone dischargers with the new device.

Novelty, Missouri, is the only Class-C QTH in the state (farther than 125 miles from an FCC examining point), according to our map at Hqs.

A snowflake carries a static charge that is estimated to be equivalent to 17,500 electrons.

Hints and Kinks
For the Experimenter

FOLDED DOUBLET FOR 3.9 MC.

Fig. 1 shows a folded doublet for 3.9 Mc. constructed of 300-ohm Twin-Lead. Electrically this antenna has done a fine job, permitting a low-power signal to get out through the QRM in the crowded 75-meter band. Mechanically, it has a few novel wrinkles that have solved the problem of how to prevent the 300-ohm line from fraying and eventually breaking at the vulnerable joints.

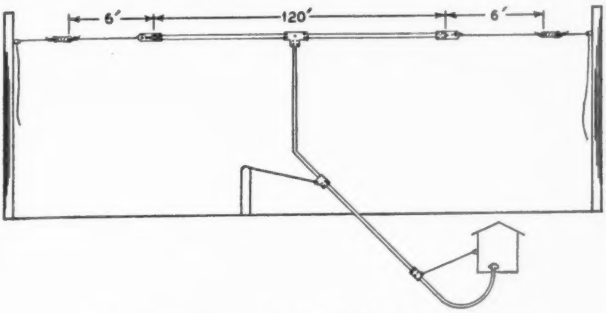


Fig. 1 — **Dimensions of a folded doublet using 300-ohm Twin-Lead. Details of the center and end attachments are shown in Fig. 2 and 3.**

A T-shaped clamp made of two sheets of 3/16-inch canvas-base Formica bolted together with 6–32 brass machine screws is used at the junction of the flat top and the feeders, as shown in Fig. 2. At the ends of the flat top clamps made of 1/16-inch aluminum are used as shown in Fig. 3. This construction permits the use of a 6-foot length of No. 14 solid enameled wire at each end of the antenna for adjustment of antenna length. It is much simpler to adjust the length this way than by clipping and then resoldering the Twin-Lead.

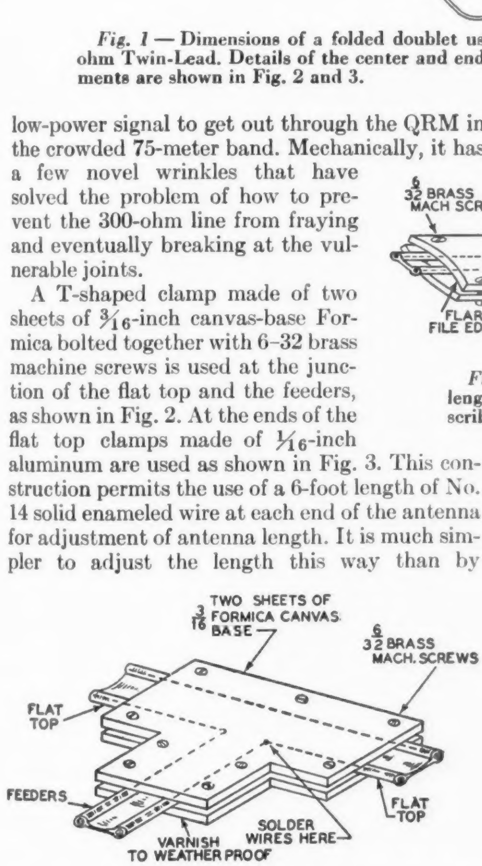


Fig. 2 — **The center bracket used to relieve the strain from the junction of feed line and antenna.**

Similar clamps of 3/16-inch Formica are used to support the feed line. At the entrance to the shack, a standard large-size porcelain tube feeds the line through the wall. The length of the feed line does not seem to be critical.

I found it necessary to cut this type of antenna longer than would be expected using the customary length formulas; about 132 feet total (including the 6-foot trimming pieces) produced optimum loading at 3.9 Mc. Another station using a similar set-up found the same thing, making use of the solid-copper-wire ends almost imperative if any length-trimming is contemplated. —*Philip S. Rand, W1DBM.*

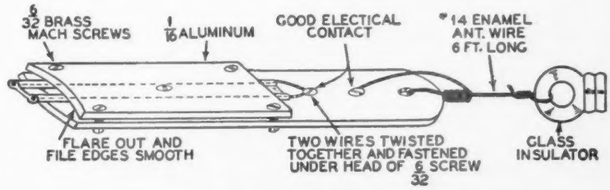


Fig. 3 — **The end clamps are used with a 6-foot length of solid wire to permit length adjustments as described in the text.**

WEATHERPROOFING 300-OHM TWIN-LEAD

This may help some of the gang who are experiencing serious detuning of their 300-ohm Twin-Lead feeders during wet weather. The venture is not at all costly, and no doubt will solve the difficulty in most cases.

The Twin-Lead was snaked through some spaghetti tubing with a wire. Thus the entire feed line was encased, and the end sealed tightly at the junction between the feed line and the antenna.

During a recent heavy rain, no change in loading of the final amplifier was noted over a period of two hours, whereas changes in plate current up to 50 ma. had been caused by even a slight drizzle before the line was encased. The losses (if any) in my case seemed negligible. — *Gordon W. Brown, W1LLL*

Looking Over the Postwar Receivers

The RME-45

The first unit of postwar receiving equipment to be announced and widely distributed by Radio Manufacturing Engineers, Inc., is the RME-45 communications receiver. In general, it seems to be no great departure from prewar technique, although it has some interesting innovations and definitely shows the influence of modern trends. The receiver and its companion speaker cabinet are both finished in gray crackle with dull black trim, in conservative modern styling. The receiver chassis doesn't occupy every available inch in the cabinet, and this fact coupled with the inclusion of generous louvres on the sides and back of the cabinet should result in a low temperature rise and consequent low drift.

In general, the receiver is built along conventional lines: one stage of r.f. amplification, converter and two stages of i.f. amplification, with the crystal filter between the converter and first i.f. stage; diode second detector, b.f.o., noise limiter, and two stages of audio amplification. All of the tubes in the receiver proper are of the lock-in type, and the full complement is shown in Fig. 1, a block diagram of the receiver.

The 7B7 is a remote cut-off tube resembling the 6K7 in characteristics. The 7J7 is similar to the 6K8, the 7B6 is a duo-diode high-μ triode, the 7A6 is the lock-in version of the 6H6, the 7C7 is almost identical to the 6J7, and the 7C5 is a 6V6 counterpart. The use of the duo-diode triode for second detector and b.f.o. is unusual, in contrast to the more conventional use of the dual-purpose tube as detector and first audio, and it is shown in detail in Fig. 2.

Panel controls include a combination line switch and tone control, r.f. gain control and a.v.c. switch, headphone jack, band-selector switch, b.f.o. pitch control, b.f.o. switch, audio gain control and noise limiter switch, and send-receive switch. The panel also includes the S-meter, the main tuning dial, the crystal-selectivity switch and the crystal-phasing control. The headphone jack is on the left-hand side of the panel, where the headphone cord is least likely to interfere with one's operations of brass-pounding, log-keeping, note-scribbling and such. The band-selector switch and the send-receive switch both use lever-type knobs which make the business of using these two controls less of a chore. Six bands are available through switching: 0.54 to 1.6 Mc., 1.6 to 2.9 Mc., 2.9 to 5.4 Mc., 5.4 to 9.8 Mc., 9.8 to 18.0 Mc., and 18.0 to 33.0 Mc. Line cord, speaker plug, S-meter adjustment and balanced- or single-wire input antenna terminals are provided at the rear of the chassis.

The RME-45 features full mechanical band-

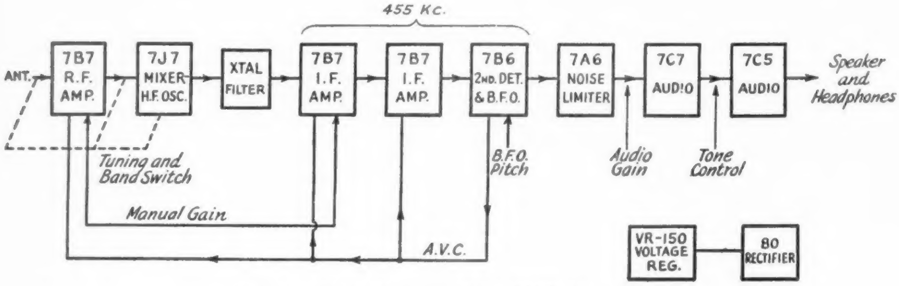


Fig. 1 — **Block diagram of the RME-45 receiver.**

spread, instead of the more common electrical bandspread. Two coaxial knobs are used for tuning — a large one set against the panel requires 80 revolutions to tune the condenser gang 180°, and a smaller knob in front of the large one is used for fine tuning and requires 385 revolutions to tune the condenser through its range. The receiver we examined showed absolutely no trace of backlash with either knob, a rather amazing condition considering the magnitude of the reduction. The dial is a full-vision affair with a pointer, and each scale is directly calibrated in frequency. All ranges are visible at any time. As the pointer moves across the dial and through an amateur band, a smaller dial rotates behind a fixed pointer and, since this small dial is graduated in 5- and 10-kc. divisions, close readings of frequencies in any amateur band can be obtained. It is unlikely that the calibration of every receiver is exact — our sample was 50 kc. off in the 14-Mc. band — but it should be no trick for the owner of the receiver to adjust the oscillator trimmer on each range to bring the amateur-band dial into close agreement with the true frequencies, since the trimmers are readily available at the bottom of the receiver. Once this has been done, the ability to switch between bands without having to reset any additional tuning control should be a rather handy feature, although all of the amateur bands do not fall in the same portion of the dial and it is necessary to spin the fast-tuning knob to get from one ham band to another. An idea of the bandspread obtained can be gained from the knowledge that 6.6, 2.0, 1.5 and 3.6 revolutions of the large knob are required to cover the 80-, 40-, 20- and 10-meter bands respectively. Using the smaller knob for tuning, these figures of course increase in the ratio of 385 to 80, or about 5 times.

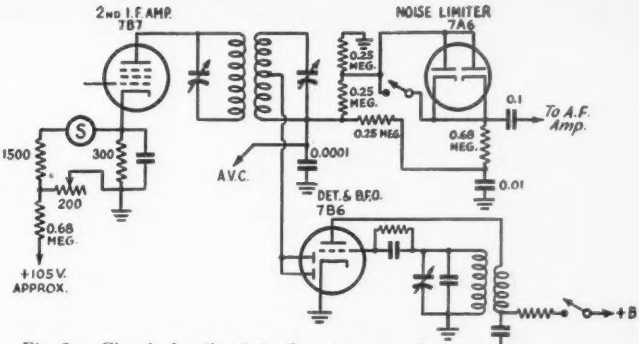


Fig. 2 — Circuit details of the S-meter, second detector and b.f.o., and noise limiter.

The r.f. gain control changes the cathode bias on the r.f. and the first i.f. stages, while the a.v.c. controls these stages and the second i.f. amplifier. The crystal-filter selectivity can be varied through five steps by the selectivity switch, and the range varies from usable 'phone selectivity to good single-signal c.w. reception. The "off" position throws the crystal filter out of the circuit. The filter is of the type introduced by Hammarlund in 1938, that seems to be widely used in communications receivers these days.

The a.v.c. voltage is derived from the second-detector load, and consequently there is no delay bias for the a.v.c. This may have been done to enable the S-meter to work at the very lowest signal levels. The S-meter circuit is the usual bridge affair, and this one measures the voltage drop across the cathode bias resistor of the second i.f. amplifier stage, as shown in Fig. 2. The dual meter scale is calibrated in db. above S1, up to 96 db., and it also has a conventional "S" scale from S0 to S9, in 6-db. steps. The meter is illuminated, and dignified by the title "Carrier Level Indicator." The designation is probably more accurate than "S-meter" because, like all such available devices, it can't be used with the b.f.o. turned on.

The noise limiter is of the series-diode type, using both halves of the 7A6 in parallel. The limiter adjusts itself automatically for different carrier levels, and this feature renders it useless when the b.f.o. is on. The noise-limiter switch is connected to the audio gain-control shaft so that when the gain-control knob is pulled out about ¼ inch the limiter is turned off. Pushing in the knob turns on the limiter, and in either position the audio control is used in the normal manner.

Regulated voltage from the VR-150 is fed to the high-frequency oscillator plate and to the screens of the converter and second i.f. stages. Mica trimmer condensers are used in the i.f. transformers and the signal-frequency stages.

The send-receive switch has three positions: "Standby," which leaves only the heaters of the tubes turned on; "On," which turns on the plate power, and "Transmit," which removes the plate power. Through terminals at the rear of the receiver, an external circuit can be closed in the "Transmit" position, permitting complete station control through the receiver switch, or through another set of terminals the receiver plate power can be controlled by an auxiliary relay or switch if the receiver switch is left in the "On" position.

The instruction book furnished with the receiver is complete in its servicing recommendations, alignment procedure description and parts list. However, no information is available from it as to production-test limits of sensitivity, selectivity, a.v.c. and gain-control action, or any of the other performance characteristics that might be of interest.

— *B. G.*

The World Above 50 Mc.

CONDUCTED BY E. P. TILTON,* W1HDQ

THE plight of the Class B 'phone men still seems to be getting a lot of attention. It is said that, with the 160-meter-band withheld, the Class B man has only the 10 meter band where he can do business. In correspondence coming in to Headquarters almost daily we see evidence that the radio spectrum begins at 30 Mc., in the opinions of a great majority of all amateurs — yet hundreds of us have been doing all right on another band. On our band many have done outstanding work with less than 50 watts input; many make out all right in isolated and otherwise "poor" locations; scores of us have worked 20 or more states; quite a few of us have excellent nightly coverage up to 150 miles, and some of us work up to 350 miles more often than you'd think possible. QRM is almost unknown, and there is an "esprit de corps" in our gang that is unexcelled in amateur radio. There's room for every "displaced person" from the 160-meter band or any other band, and newcomers are welcomed with open arms. It's 6 meters, of course — come up and see us some time!

Let's look over the record and see what's been done on 6 meters in the first six months of its existence as an amateur band. Bearing in mind that every piece of gear used to date on 50 Mc. had to be adapted from something else, or built from scratch for the purpose, we think that the boys on 6 have every reason to be proud of the accomplishments listed below:

1) More contacts have been made at distances beyond 2000 miles than were made in the entire history of v.h.f. operation before the war.

2) At least six stations, WØYUQ, WØZJB, WØBJV, W9ZHB, W5JGV/7, and W2BYM, have worked all call areas, W2BYM being the first Eastern station to make it in the history of v.h.f. work.

3) At least seven transcontinental contacts have been made. These include W2BYM-W6OVK, W6NAW-W1LLL, W6NAW-W8CIR/1, W4HVV-W6ANN, W4HVV-W6FMH, W4HVV-W6QG, and W4CYW-W6ANN. Only one transcontinental contact (W1EYM-W6DNS) was made in all the years of work on 56 Mc.

4) An all-time v.h.f. record for miles-per-watt was set by W6RVL, Los Angeles, California, in working W8QYD, Dayton, Ohio, a distance of 1900 miles, with a power of 3.5 watts.

5) Work is going on in several localities, over distances up to nearly 400 miles, without the aid of sporadic-*E* skip.

RECORDS

Two-way Work

50 Mc.: W6OVK-W2BYM
2500 Miles — June 14, 1946

144 Mc.: W3HWN-W1KOE
310 Miles — July 5, 1946

420 Mc.: W6VQB/6-W6URA/6
96 Miles — July 5, 1946

2300 Mc.: W1JSM/1-W1ILS/1
1.6 Miles — June 23, 1946

5250 Mc.: W2LGF/2-W7FOF/2
31 Miles — December 2, 1945

10,000 Mc.: W4HPJ/3-W6IFE/3
7.65 Miles — July 11, 1946

21,000 Mc.: W1NVL/2-W9SAD/2
800 feet — May 18, 1946

A glance at the "states-worked" column in this issue shows that eleven of the contestants in all parts of the country had worked 15 or more states on 50 Mc. before the end of July, and these who report their contacts are but a fraction of the active stations. Many fellows, some of whom never hear a signal on 6 except when the band is open for skip, have worked 50 or more different stations. Who does this work, and with what sort of gear? No, these fellows are not supermen, with mountain-top locations, kilowatt rigs, and acres of antennas at their disposal. Most of them are just garden-variety hams, who are really interested in what they are doing — fellows who are riding their hobby for all it's worth, and having a swell time of it, as a result. Like W6RVL, quite a few are using as little as 3 or 4 watts input, and practically all are running "low power," in comparison to the layouts used for the QRM battle on the lower frequencies. No place for the Class B ham?

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What is the DX season on 6? After the big blowout in late July, a traditional feature of the v.h.f. DX season, we looked for the beginning of the end, for another year. By the first week in August it used to be all over, and experience on 50 Mc. is somewhat similar, but the sporadic-*E*

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*V.H.F. Editor, *QST*.

Not all 50-Mc. arrays are horizontal. W2EUY, Riverton, N. J., uses this 4-element rotary to work the vertically-polarized stations down Washington way.

skip has been holding up longer than we expected. During the month of August, skip-DX was worked on at least 16 days, with the last opening reported to date being on the 24th. Openings have been brief, and signals none too strong or steady, but contacts have been made almost daily, even so.

Observation of the 28-Mc. band showed it to be open for F_2 skip regularly during the month of August, often with signals running very strong and steady for long periods at a time. The maximum usable frequency is reaching 40 Mc. already, and before long it will be passing 50 Mc. in some sections of the world. By the time this appears in print, there should be a definite possibility of DX contacts on 50 Mc., *if* stations are on in the right places at the right time.

The right places include the southern part of the United States, Puerto Rico, the Azores, the Hawaiian Islands, and the many other tropical and semi-tropical locations. We hear that W1DTS/CT2 is interested in the possibilities of work from the Azores, and W1NSS, recently returned from the Hawaiian Islands, says that there is a certain amount of interest out there. We hear KH6AR running listening tests with W6PBD on 10 and W5JGV/7 on 6, and understand that Ken is getting set to do some transmitting on 6 as well. In Puerto Rico, K4KD and others promise to be working on 6 before the peak of the fall season.

In England, G5BY continues his schedules, still without positive results, as far as reception in this country is concerned, though he is working into the Continent occasionally. On July 21st, F8RSN, F8BC and F3JB were worked with S9 reports. Several "heard" reports have been received from Switzerland, but no HB contacts have been made by G5BY. On July 8th a new inter-G record was set by working G8UZ, a distance of 256 miles. Skip often is in evidence on 50–54 Mc. when signals are not heard in the 58.5–60 range, as evidenced by the presence of numerous commercial harmonics, which always appear on 50 Mc. first, and then, a few minutes later, on 58 Mc. if a good opening is coming. On August 3rd, between 2012 and 2030 GCT, the following c.w. was heard on 50.7 Mc.: "NBBY V NBVW QTC OP OM OP K." The call NBWW also figured in one transmission. On Aug. 4th, at 1745, the following was heard on approximately 52.5 Mc.: "W?? de KYL QTC K." These signals were obviously harmonics, apparently of U.S. origin. Can anyone tell us more? The Sunday transmissions of G5BY (see July *QST*) will be continued into the fall, in the hope of contacts, or reports, via F_2 skip.

A note from HB9AT, Berne, Switzerland, says that he is active on v.h.f., but gives no details.

From at least a dozen sources we have word that signals are being heard in South Africa on 50 Mc. All our efforts to track this rumor down have availed us very little in the way of concrete information. From ZS6Z we learn that a listener "heard W1JLK on 5 meters at approximately 3 A.M. in early November, 1945," but no other details are given. Another signal reported heard by the same listener was W7EYN. ZS6Z has no information on any 50-Mc. reception in recent months, and ZS6DW, from whom the reports emanate has nothing more than the report that signals have been heard.

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Around the Country on 6

An antenna helps! To get going on 6 quickly, W1HDF, Elmwood, Conn., rigged a temporary set-up using an RK-34 in the final stage, running 24 watts input. The antenna was an indoor doublet. Results: not much. Then a duplicate of the 4-element horizontal array described in these pages in June *QST* was erected. Results: plenty! Even with this low power, Carl is putting a very respectable signal into the Boston area, and into New Jersey, both points 100 miles or more distant. With a 3-element horizontal, W1KJC, in nearby Wethersfield, is also working out well with 30 watts or so to an 815. Both these fellows worked W8CIR/1 at Mt. Agamenticus, near York, Maine, on August 24th, a night when conditions were below average. W1KJC and W1HDF

are both below 100 feet elevation. The Maine location of W8CIR/1 was only a few hundred feet above sea level, and Ed's mobile job was running about 12 watts input. He, too, had a beam — 3 elements, horizontal, arranged for portable use. Maine contacts were provided for many other W1s, and W8CIR's prize contact was with W2BYM, Lakehurst, N. J., a distance of 280 miles. All this with no help from any favorable propagation conditions!

On another expedition earlier in the month, W8CIR/1 operated from Mt. Washington, N. H., highest point in the Northeastern part of the country. This trip would have been a complete flop, but for the fact that Ed had the foresight to equip his mobile job for keying. At the mountain top the speech amplifier quit, and yet W8CIR/1 contacted stations all over New England, and worked W2AMJ and W2BQK, both of Bergenfield, N. J., a distance of 285 miles, pounding out the whole session on c.w.!

Something quite different from the famous California Kilowatts is used on 6 meters in the Los Angeles area. Many of the gang are using converted MBF transmitter-receiver units. With one of these 3.5-watt jobs, W6RVL worked W8QYD, Dayton, Ohio, and quite a number of contacts have been made with W7s and VE7s by the L.A. gang, including W6s VIC, DMK, TJV, AOR, BWG and VDE, who are all using the MBF rigs. W6GQ, Santa Ana, was using one, and he worked his share of the DX with it, even with a simple dipole antenna 18 feet above ground. Ray has since graduated to a 100-watt rig, with some improvement in the percentage of stations raised.

What would we do without those commercial harmonics? Some of those fellows really get out on 50 Mc., even if the harmonic is the third. The stations reported by G5BY (see above) are probably in that category. Two who make a lot of noise around these parts, and are reported occasionally in the Middle West, are WKR, heard almost constantly on about 51.5, usually with m.c.w., and WCC, about 50.6. A station running foreign-language broadcasts has been heard by WØZJB on 53.6. This one is probably here in the East, as it is heard in W1 now and then also. Still another, as yet to be identified, runs high-speed telegraphy near the high end of the band. It might be well to keep watch for those 34-Mc. air beacons from "Down Under," as a clue to high m.u.f. in that direction. W5LIU, Fort Worth, Texas, has heard SY, Sydney, Australia, recently.

Looks like big doings at Topeka on October 5th and 6th. The Midwest Division Convention is being made the occasion of a big v.h.f. meeting. Latest reports indicate that v.h.f. enthusiasts, including the writer, are coming from far and wide, and "See you in Topeka" is becoming the watchword.

V.H.F. MARATHON

Call	Contacts Through July 50 Mc.	144 Mc.	235 Mc.	Score	States Worked 50 Mc.	144 Mc.
W1AEP	47			395	14	
W1BDI/1*		14		36		2
W1BCT*		119		526		4
W1CGY	35			287	14	
W1DXL		46		216		5
W1FJN	44			366	14	
W1HDQ[1]	87	99		1478	24	7
W1JNX*	7	83		298	1	1
W1KLR		48		254		2
W1LLL	85			873	23	
W1LMU		106		384		3
W1MBS*		113		358		2
W8CLS/1	102			864	22	
W2AMJ	78			641	23	
W2BQK				454	17	
W2BYM	93			755	22	
W2COT	9	8		51	3	2
W2DZA		141	4	598		5
W2JWO		127		790		8
W2LXO		173		714		5
W2PWP	69	15		603	17	2
W2QVH		172		685		4
W3BKB		31		158		4
W3BTP*		40		187		1
W3CGV	26	39		367	7	4
W3GKP*		72		451		5
W3HWN		105		892		7
W3KIE		61		291		3
W3LN*		113		590		5
W3RUE	21	6		328	12	1
W4CDG/3*	9	90		532	6	5
W4HVV	32			574	15	
W6SLO/5	17			181	11	
W6ANN	61			688	11	
W6BWG	16			37	1	
W6NJJ*		194		950		1
W6OVK	9	23		274	6	1
W6QG	31			342	8	
W6RVL*	96	138		648	4	1
W6TGY*		33		88	1	
W9LLM/6	11			58	3	
W7QAP	27			528	11	
W5JGV/7[2]	52			1212	19	
W8NKJ	15	4		85	7	1
W8NOR	6	35		265	3	2
W8WKE		7		30		1
W9AB	12			77	5	
W9ACU	8			84	2	
W9ALU	10			102	5	
W9NCS	28			228	8	
W9PK	37			324	14	
W9UNS	16			213	11	
WØYUQ	55			678	18	
WØZJB	85			942	22	

* Includes portable or mobile operation.
[1] Not eligible for award.
[2] W5JGV/7 winner for July with 822 points.

The promotion of interest in extended-local work goes on meanwhile. WØZJB and WØYUQ now have WØJCQ, Riley, Kansas, in on their nightly skeds. These fellows are also running tests with WØNFM, Solon, Iowa, and contact has been made on several occasions by ZJB and YUQ, the distance being about 250 miles for ZJB and more than 300 for YUQ. WØJCQ, 18 miles from Manhattan is hearing NFM, but no contact has been made, as yet. W9ZHB, about 400 miles, is the next target. Another path over which tests are being made is the rough jump from

Tucson to Douglas, Arizona. Mindful of the workouts of W6QLZ and W6OVK over a similar distance in the opposite direction from Tucson, W7QAP and W5JGV/7 hope to make it, eventually. There is plenty of rugged country in between, but it should not be impossible.

The best distance worked in the East on 5 in prewar days was the hop from New England down to Washington, D. C., managed, on occasion, by stations situated in the better locations. No one has yet made it on 6, except by means of aurora or sporadic-E skip, but the signals of W1KMZ/3 have been heard, and Rick is hearing several W1s occasionally. From Waltham, Mass., to Washington is close to 400 miles, yet W8CLS/1 and W1KMZ/3 have heard each other several times. W1EYM, Fairfield, Conn., has worked W1KMZ/3, a distance of about 275 miles, and W1LLL and your conductor have heard, and been heard by, W1KMZ/3, 315 miles. This all started after W1KMZ/3 turned his array over horizontal, matching the horizontal beams of the W1s.

Getting that radiation angle down is the primary aim in this sort of work. WØYUQ uses two 3-element arrays, one a half wave above the other, fed in phase. This gives an improvement of 6 db. or more in the long-haul work. Thinking to improve matters, WØZJB raised his 4-element job from 24 to 40 feet (with the able assistance of YUQ and JCQ, who made the 300-mile round-trip for the purpose) and now signals are not as good as they were with the array at the lower level. Sufficient time has not yet elapsed to determine whether this is the result of antenna height or propagation conditions, however.

Last month we listed Kentucky as one of the states where no resident activity had been reported on 6. Now we hear from W4JML, High Splint, Ky., who will be on just as soon as he can get a converter. That has held a few others back that we know of, too! He wants to know if there is any activity elsewhere in his state.

We often hear of 2-meter gear being used to assist in timing and checking of athletic events of various sorts, but here is an instance reported by W6NAW, where 6 was used effectively for such work. At a recent water sports carnival, the Santa Monica Mike and Key Club had transmitters in boats and at the public-address system, used to relay information to the spectators direct from the scene of action.

What About Two Meters?

As an amateur band, 144 Mc. is also new. When the allocation was first announced many of us didn't think too much of the idea. We had enough trouble getting gear to operate efficiently on 112, without moving another 32 Mc. higher in frequency. Yet move we did, and with surprising results. We have now completed a summer season, and we've had a chance to see what really can be done. Literally thousands of stations have flocked to the band, and in several areas work beyond 200 miles has become quite common. Several contacts have been made beyond 300 miles, and it is probably only a matter of time before the 355-mile record for 112-Mc. work will be equaled, or even surpassed.

More 50-Mc. Frequencies

W1CLH Bridgeport, Conn.	52.0 Mc.
W1IYO Milford, Conn.	50.005
W1JLK Woods Hole, Mass.	50.32
W1OLO E. Providence, R. I.	50.1
W2OPQ Schenectady, N. Y.	50.4
W4FNR Miami, Fla.	52.8
W4JML High Splint, Ky.	50.5
W6QG Santa Ana, Calif.	50.7
W6RVL Los Angeles, Calif.	51.6, 51.84
W6UHC Glendale, Calif.	51.5
WØJCQ Riley, Kansas	50.4
VE7AEC Ioco, B.C.	51.6
VE7AHZ Burnaby, B.C.	52.0
VE7BQ Vancouver, B.C	50.8
VE7NM Vancouver, B.C.	50.6
VE7VY Vancouver, B.C.	50.2

While a large part of the work has been done with the simplest sort of gear, there have been sizeable groups in some parts of the country, notably in W3 and W6, whose transmitters, receivers, and antennas have reached a stage of development comparable to the best to be found on any amateur band. We had an opportunity to observe this fine state of affairs first hand recently, when we attended the York (Pa.) Radio Club hamfest. Visiting the shacks of W3HWN, Mechanicsburg, and W3BKB, York, was an enlightening experience. There we found whole station layouts devoted entirely to 2-meter gear, and they would stand comparison with the finest low-frequency stations. Nicely-built crystal-controlled transmitters, selective smooth-working superhets, high-gain beam antennas with automatic rotating devices — such things are almost standard equipment for 2-meter work in that area. We had the novel experience of being able to copy practically every signal we could pick up on our mobile superhet, without asking anyone to back off on the audio. Even quite a few of the mobile jobs at the Hamfest were crystal-controlled. These fellows do it *right*, and the results they get are the best justification of their technique!

From them, and from others interested in the advancement of the art, we hear expressions of concern over the future of the 2-meter band. Anyone who has operated in any of the areas where there is appreciable activity cannot but realize that 2 will soon reach the state that overcame 5 in the days before the stabilization. The very ease with which fellows can have fun on the band may soon turn out to be a curse as well as a blessing. Already we have reached the saturation point, where QRM is the limiting factor rather than conditions, location or equipment. What is the answer?

Not a few are arguing for stabilization regulations, but we feel that this is not the solution. On the basis of present conditions, at least, we are unalterably opposed to any such move, and we know that the vast majority of 2-meter men feel the same way. A likely suggestion is offered by W6OVK. Let those of us who use crystal control or its equivalent concentrate our activity in the first megacycle of the band, or within 200 kc. of the high end, and those who use modulated oscillators, or other rigs incapable of being received on a sharp superhet, stay between 145 and 147.8 Mc. It is hard to see how this could do anyone any harm, and it would work to the advantage of both groups. The low-powered oscillator rigs would be free of QRM from the more potent crystal-controlled stations, and the boys who want to use advanced techniques will be able to do so without the hash (and it *is* a pretty awful sounding mess!) of the modulated oscillators smearing their every effort.

The important angle in all this sort of thing is that it is a matter of individual coöperation and initiative. There should be no compulsion about it — it must be a matter of all of us working together for a common end. We've talked it up a bit already, and find no objections on either side. Let's think it over!

—•••—

Needed: more careful listening! Many opportunities for long-haul contacts are being missed because so many fellows fail to appreciate the possibilities of the band. The boys in Pennsylvania and Maryland told us that they hear W2s and even W1s, night after night, and only occasionally are they able to work them. W3GKP, Silver Spring, Md., says that time and again he hears W2s coming through with good readable signals, working each other and gloating over "DX" contacts of 40 miles or so, when they are actually getting out to distances of 200 miles or more! W3BKB, W3HWN, and others join in the plea: "Tell those fellows up there to look around the band once in a while, and not stop at the first S9 signal they hear!"

Another of those Pennsylvania W3s who is going places on 2 is W3KIE, Lancaster. John has solved the vertical-horizontal question in a novel manner, and is set to give anyone "the works" with either polarization, with one array. You've guessed it — a plane reflector, with vertical elements on one side and horizontal on the other. The array at W3KIE is something to behold: the vertical portion is composed of 12 half-wave elements in phase, 4 high and 3 wide. The horizontal side has 10 half-waves in phase, 5 high and 2 wide. The screen is chicken wire, 2-inch mesh. Despite the fact that the location of W3KIE is lower than much of the surrounding terrain, signals from the New York area are heard on the better nights.

The work of these W3s is the more impressive when one considers that they are well inland, and consequently are not blessed with the degree of bending that is an almost nightly affair along the coastal areas. When the right conditions are set up (and this happens pretty often close to the seacoast) you can work 200 miles or more with almost anything. Farther inland it is definitely a different story. You don't work DX from Mechanicsburg, Lancaster, or York with 5 watts input and a folded dipole in the attic!

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Two meters is a late band. The summer and early-fall temperature inversions take no account of the need for sleep, and much of the best DX is worked by the night owls who stay with the band until the last signal is gone. Practically all our records and near-records are in this category, and here are a few examples of DX work done during the wee small hours in the month of August, and in late July. July 30th–31st: W2VH/1, Scargo Hill, E. Dennis, Mass., worked W3GQS, Feasterville, Pa., 280 miles, W3BM, Minotola, N. J., 295 miles, and several others beyond 200 miles, using an HY-75 mobile rig and a 5-element beam. Aug. 6th–7th: W2ATK, Pt. Pleasant, N. J., worked W1KIM, Winthrop, Mass., 245 miles. Both stations were at sea-level locations and used simple dipole antennas! W1NXJ, Mattapan, Mass., worked W2LXO, West Orange, N. J. W1NXJ was running 12 watts input and using an indoor dipole. Aug. 9th–10th: W1EHH/1, atop Mt. Wachuset, near Princeton, Mass., worked W3GMY, Vineland, N. J., 280 miles, as well as W2s ADW, EBT, DPB, FI, LBA, DZA and OHE. This with an HY-75 and a folded dipole! W3GMY has an f.m. rig with an 829 in the final and a 4-element beam.

The log of W1KOE, Wakefield, R. I., shows 45 stations beyond the normal working range worked during the period between July 28th and Aug. 8th. These include 1 in New Hampshire, 8 in the Boston area, 6 in Western Connecticut, 13 in New York, 14 in New Jersey, 2 in Pennsylvania, and 1 in Delaware. Several of these are beyond 200 miles, and they give W1KOE a total of eight states worked on 144 Mc. He repeats the familiar plea: "What can we do to get fellows to sign carefully and to look around the band?" He hears W2s and W3s tied up in local rag-chews, some of them fully convinced that there is no point in looking around because their signals "don't get out anyway!" W1KOE, W1LPO, and W1JFF, all in that elusive and seemingly hard-to-work little state of Rhode Island, have this trouble almost nightly during the summer and fall months.

Who is the leader of states-worked on 144 Mc.? Several have 8 that we know of, and W2JWO, Patchogue, L. I., has New Hampshire, Massa-

(*Continued on page 126*)

Correspondence From Members-

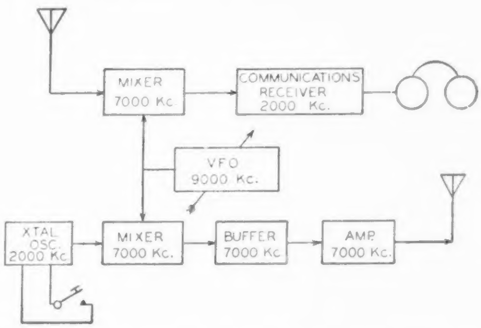
The Publishers of *QST* assume no responsibility for statements made herein by correspondents.

THE VFO PROPOSAL

11,904 Thornewood Ave., Cleveland, Ohio

Editor, *QST:*

I have been very much interested in your editorial comment in recent issues of *QST* on desired improvements in VFO control and on automatic tracking methods. W5CAT's idea and your editorial in the August issue led me to describe a system which occurred to me several years ago. It has, I believe, all of the desirable features you mention and few of the undesirable. It is not a beginner's problem but would not be too difficult for the skilled amateur. It has been used and is of proven merit, the basic idea being incorporated in ionosphere-sounding transmitters and receivers used by the Carnegie Institute. A transmitter using this system is now under construction here at W8QZP/8 but probably will not be completed for several months because of lack of time.



The system, as modified for amateur use, is illustrated in the block diagram. The regular communications receiver acts as an i.f. and is tuned to zero-beat with the crystal oscillator. Thereafter, tuning the VFO will automatically track the receiver and transmitter. If it be desired to keep the transmitter 2 kc. to one side of the received signal, the receiver is simply set 2 kc. off zero-beat. If the operator calls CQ he listens for a call by leaving the VFO alone and tuning the receiver (the i.f.). The VFO runs continuously and is not keyed. Keying is done in the crystal oscillator at intermediate frequency. The VFO operates at the same frequency on all bands. The frequency is not harmonically related to any of the transmitter frequencies and thus interaction and r.f. feed-back should not be troublesome. The VFO bandspread is uniform on all bands. Its full spread should be 500 kc. — say 9000 to 9500 kc. This will give 100 per cent coverage on 80, 60 per cent coverage on 40, 80 per cent on 20, 100 per cent on 15 (when we get it). Ten kc. on the VFO dial is 10 kc. on any and all bands. No ganged circuits are necessary. The VFO is the only tuned (tunable) circuit. Broadband amplifiers can be used in the mixer and transmitter circuits, or ordinary circuits are practical since only slight "touch-up" tuning will be required between one end of a band and the other. The 9000-kc. VFO frequency was chosen to allow a fairly uniform i.f. for the different bands:

Band	*VFO Range*	*I.F.*
3500– 4000	9000–9500	5500
7000– 7300	9000–9300	2000
14,000–14,400	9000–9400	5000
21,000–21,500	9000–9500	12,000

Selection of the proper sum or difference frequency should be easy because of the high i.f.

One simple possibility is a two-band rig with the VFO on the mean frequency:

Band	*VFO Range*	*I.F*
7000– 7300	10,500–10,800	3500
14,000–14,400	10,500–10,900	3500

However, the thought of image interference and 3500-kc. pick-up made me decide against trying this latter scheme.

— *Omar E. Snyder, W8QZP/8*

Corona Naval Hospital, Corona, Calif.

Editor, *QST:*

In regard to the August *QST* editorial, I'd like to point out that 99 per cent of the features you've been daydreaming about can be found in the set advertised on page 137 of the same issue, for only $34.50. This surplus tank rig has been pretty thoroughly ballyhooed here on the coast, so I suspect quite a number of hams will be buying it.

You spoke of using a master oscillator of 455 kc. mixed with the receiver oscillator to furnish the exciter frequency. This rig has just that — with tuning of the local oscillator, receiver r.f., and two transmitter buffers, all on the same condenser shaft! For break-in operation, your receiver is always on and xmtr warmed up. The 455-kc. osc. is variable, being also the b.f.o. and controllable from the front panel, though perhaps not as much as 5 kc. These sets cover the 40–80–160-meter bands and have in addition an entirely separate 1¼-meter four-tube transceiver as well as an intercom system.

In short, the set-up has everything you want with the exception of a ganged antenna tuner, and optional crystal control, which could be provided easily. Another drawback is the low-power dynamotor supply, but with a.c. power the output could be raised to perhaps 30 watts. . . .

— *Walker V. Clute, RM3c*

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72 Bowler St., Lynn, Mass.

Editor, *QST:*

To cope with the present situation and also future amateur operating, I believe that KBW has the right dope: the use of one channel (same frequency) in communication by VFO or other means. So let's all square away, plan to play fair, and help make room for all with the least QRM.

I second the motion proposed under "How's DX," page 57, July *QST*, on using "NS" and "SN," where NS indicates all replying should stay clear of the CQer's frequency by at least 1 kc. Yes, by all hi-power and little QRP rigs, let's play the game for the most fun. Fight fairly, break clean, and no cussing. Here's to DX!

— *Harold Ryall, W1NKW*

CODE-PRACTICE QRM

3417 W. Palmer St., Chicago 47, Ill.

Editor, *QST:*

From time to time I have heard the rumor that, for some psychopathic reason or other, there were about a dozen quote hams unquote who were "anti-League." I never knew just what they stood for (or against), or what "anti-League" really meant, but I tried to find this out at ham-

(*Concluded on page 138*)

Operating News

F. E. HANDY, W1BDI, Communications Mgr.
E. L. BATTEY, W1UE, Asst. Comm. Mgr.
GEORGE HART, W1NJM, Communications Asst.
J. A. MOSKEY, W1JMY, Communications Asst.
LILLIAN SALTER, Communications Asst.

3575–3600 kc. for General Traffic Work. It was great to be able to use 3.5-, 7- and 14-Mc. in summer operating — like old times to hear all these bands hot with activity! Fall is now upon us. With so much of amateur radio back to normal, operators are now busy with net planning, DX, and general activity. Note the announcement of Traffic Plans elsewhere in these columns. The *General Traffic Channels* (3575–3600 kc.) are the place to go (6:30–8:30 P.M. local time daily) to stand best chance of getting a message for your locality, or to move one to domestic points afar. Use this time and frequency and report traffic results monthly to your SCM! With fall here, all Emergency Coördinators have as first business on their slate review of the necessary Emergency Operating Plan for their communities — with a September meeting bringing this to the attention of all amateurs. This seems essential to be sure we are ready for any emergency-radio needs, as well as for the national tests and local activities that are coming up.

Last Call for October Emergency Test. Attention is invited to a box announcement regarding the simulated-emergency (nation-wide) plans that were mentioned first in these columns last month. On either October 12th or 13th some "incidents" calling for amateur radio facilities and special local operation will develop in your community. Both 144-Mc. rigs and low-frequency links may be called on. You will not know all about this as the Test goes along unless you are lined up with the ARRL Emergency Corps and in contact with your community Emergency Coordinator. Right up to those October dates we'll do our best to give prompt service on sending AEC applications (Form 7) to all who want to get lined up. We know every SCM and EC will do the same. Your EC will appreciate your participation on and around those dates so you can enjoy the test opportunity and become part of the dependable group he is organizing to do necessary things either now or when a real emergency strikes! If you haven't yet indicated your equipment and interest, to help amateur ability-to-perform in emergency, why not do so today? A postcard or radio message to Hq. will bring you a Form 7 application.

On Getting the Most from Amateur Operating. Amateur radio is all things to all people, and we're not one to try to convert anyone from one form of activity to another. It's our hunch that sooner or later all of us try them all, and enjoy them all. Practically all amateurs build stations *to communicate* or at any rate it is only through using our brain children that we can find out what they can do, and consequently improve adjustments for maximum performance!

Two weeks of operating from a vacation spot with a 6L6 final (leaving bigger bottles behind) were a lot of fun. Several improvements in the portable set-up were developed that we never would have found time for, except by leaving our more ambitious gear behind. But the high point of station testing was participation in our first postwar party (operating test) open to *all* CD appointees on July 27th–28th. It brought home the fact that in almost all ARRL activities and station tests, *organization* makes it possible for us to obtain results in a week-end or so of operation, that would take the nonorganization amateur some months of average amateur working to accomplish. *Organization* is the magic that gives superior results or QSO-report-knowledge to each member through mutual coöperation and collaboration toward common ends.

ARRL is a mutual-benefit association for the representation of the amateur, striving in every way possible to add to the effectiveness of the individual station and to increase the pleasure and profit of the member in his hobby. While certain general activities are announced for all amateurs, additional dividends in pleasure and results are available to members of groups holding *appointment*, looking to specific objectives. Why not let *organization* work more concrete magic for you by lining up for the appointment that appeals to you. A high standard of operation, telegraph or voice, is called for in each "station" appointment. In general each appointee offers some specific service to other appointees, or even the whole fraternity. Leadership in our groups of course brings its own reward through fraternalism and increased organization strength and success.

This is all by way of saying that with the fall season at hand all amateurs whose stations,

operating, and objectives meet the descriptions set down in *Operating an Amateur Radio Station,*[1] are invited most cordially to secure the appropriate appointment application forms from their SCM[2] or ARRL Hq. so they may fully participate in their operating organization. By so doing they will get the most from their operating efforts along the lines of natural amateur inclinations. For general reader information abbreviated descriptions of the types of ARRL-SCM appointments that can be made, with the purpose of each, are given below:

LEADERSHIP AND STATION APPOINTMENTS

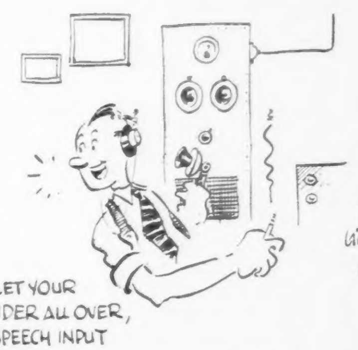
SEC	Section Emergency Coördinator. Promotes and administers Section Emergency-Radio Organization.
EC	Emergency Coördinator. Organizes amateurs of a community or other area for radio emergency service; liaison with officials of agencies served and with representatives of other communication facilities locally.
ORS	Official Relay Station. Traffic Service, operates nets and trunk lines.
OPS	Official Phone Station. Voice operating, assists in establishing high operating standards.
OES	Official Experimental Station. Experimental operating, collects reports v.h.f.-u.h.f.-s.h.f. propagation data or contacts, some engage in fax, f.m., tv, etc. experiments.
OBS	Official Broadcasting Station. Transmits ARRL Bulletins to amateurs.
OO	Official Observer. Sends mail (or radios) coöperative notices to amateurs to assist in frequency observance, insure high quality signals, and prevent FCC trouble for the individual or the fraternity.
RM	Route Manager. Organizes traffic nets and coördinates schedules.
PAM	Phone Activities Manager. Organizes activities for OPS.

W1AW Expands Schedule. Attention is invited to the new fall operating-visiting hour schedule for Hq. station W1AW. See page 58 this issue. "Bill" Matchett, W1KKS, joins our station staff having already made a name for himself brass-pounding in the Arctic on MacMillan's *Bowdoin,* KLPO. The summer cruise and equipment were described (with photo of Bill) in September *QST*. With October here we are glad to be able to increase the periods specified for general contact with "any amateur" on the different bands, to add bulletin transmissions Sat.-Sun., and later-night periods that will clear coast-to-coast traffic.

CD Staff Notes. Additional personnel at W1AW are Bill Matchett, W1KKS, and Tom York, W1JBJ, a prewar member of the CD staff. The Communications Department also takes pleasure this month in announcing the return of George Hart, W1NJM-D4ALS. Until his separation from the AAF, Lieut. Hart served with Hq. AACS, and with Hq. 5th ACS Wing overseas. George needs no introduction to operating amateurs, having worked so many from W3AMR, and W1AW (since 1938), and having carried the ball as Acting CM in '43-'44. "Geo" will give full time to a Training Aids project designed to assist all Affiliated Clubs with their lecture and visual programs.

A.R.R.L. OFFICIALS NITE, Oct. 5th. A club-convention itinerary places us at the West Gulf Division Convention September 22nd, so we're going to miss the expected fun in the Get-Acquainted Party unless we can make it on-the-air from W5. But we're slated to be home for, and bound we're *not* going to miss some contacts in, the first postwar *ARRL Officials Nite,* October 5th.

What's an Officials Night does someone ask? 'Tis the monthly time when all ARRL leadership appointees (SEC, EC, RM, PAM) and the elected-appointed officials (Director, SCM, Hq. Staff, Asst. and Alternate Director personnel) get together informally on the air to work each other and "talk it over." It combines fraternalism with station operating and a chance to keep in touch with friends in and beyond each ARRL Section. The *Nite* promotes sectional and national League solidarity and progress. There's no scoring. It's not a contest, but Hq. issues a list of those who were on, and who they worked. Any frequency band that's open can be used, come early or late. "Eighty" is a favorite band but skeds on others are sometimes made. It's easy to remember to be on. *The first Saturday night* in each month is generally the night. Formerly *RM Nite,* the ECs



The efficient operating position is one where interest may be concentrated on the objective at hand — *operating!* Distractions in the operating room simply cause confusion at both the transmitting and receiving ends. Establish your ham shack for *communication* purposes. It's a rare individual who can successfully combine clean-cut acceptable communication with a "party in the radio room." It's not good hamming, either. Show the operator you are working the respect of keeping your mind on the QSO, not on what is taking place in your shack. Keep your modulation level constant by maintaining a standard distance from the microphone. You cannot do this, if you try simultaneously to hold a double-header conversation with your radio contact and the folks at home.

[1] Sent free on request of any ARRL member. Operating Practice, Activities, Emergency Communication, Field Organization, Leadership and Station Appointments, Handling Messages, Network Organizing and NCS Functions, Ham Abbreviations, FCC Regulations & Orders are included in this booklet.

[2] For full list of SCMs with addresses see page 6, any *QST*.

have now outnumbered other "dignitaries." To make this truly of, by and for all ARRL officials, the official call for establishing contact with others of the group will be "CQ ARRL." The letters of your appointment or post can be added to your call in getting acquainted, but are not necessary in working old friends. Some QSOs are snappy, some very long. We're announcing ARRL Officials Nite here just this once in starting it off so all hands will know what's going on, and so every officer and official will know the Nites are being resumed. 73. BCNU.

—F. E. H.

CODE/THEORY INSTRUCTION

Attention of ARRL-affiliated club secretaries is invited to the listing in June *QST* (page 75) of clubs giving instruction in radio code and theory. It is desired to compile an up-to-date list of affiliated clubs conducting such programs for all local operators and beginners (members and nonmembers). If your club has code and/or theory lessons under way, please advise us so that we may pass the word to those interested. Be sure to indicate whether the program is "open to all."

CALENDAR OF A.R.R.L. ACTIVITIES

Oct. 12th–13th: Emergency Corps Test
Oct. 17th: CP Qualifying Run
Oct. 26th–27th: CD QSO Party (Open to all appointees and officials)
Nov. 16th: CP Qualifying Run
Nov. 16th–18th and 23rd–25th: Sweepstakes Contest
Dec. 15th: CP Qualifying Run
Jan. 11th–12th: ARRL-Member Party
Jan. 14th: CP Qualifying Run
Jan. 25th–26th: CD QSO Party
Feb. 13th: CP Qualifying Run
Feb. 14th–17th: DX Competition (c.w.)
Feb. 21st–24th: DX Competition ('phone)
Mar. 14th–17th: DX Competition (c.w.)
Mar. 17th: CP Qualifying Run
Mar. 21st–24th: DX Competition ('phone)

May 1st–Dec. 31st: 1946 V.H.F. Marathon (complete details in May *QST*)
Mar. 1st–Dec. 31st: WAS Competition Above 50 Mc. (see page 80, May *QST*)
Started Mar. 1st: Competition for First WAS on 50-Mc. Band (See page 58, May *QST*)
First Saturday Night Each Month: A.R.R.L. OFFICIALS NITE (Get-together for SCMs, RMs, SECs, ECs, PAMs, Directors, Alt. and Asst. Dirs.)

W1AW OPERATING SCHEDULE

(Effective October 1, 1946)

Operating-Visiting Hours

Monday through Friday, 8:30 A.M.–1:00 A.M.
Saturday, 7:00 P.M.–2:30 A.M.
Sunday, 3:00 P.M.–9:00 P.M.

Staff:

John T. Rameika, W1JJR, "JR"
Thomas W. York, W1JBJ, "TY"
Wm. H. Matchett, W1KKS, "BM"

Official ARRL Bulletins containing latest FCC information relating to amateur operation and reactivation, and other bulletins on matters of general amateur interest, are transmitted on regular schedules, as follows:

Frequencies: 3555, 7145, 14,150, 28,060, and 52,000 kc. (Voice — 3950, 7145, 14,280, 52,000 kc.)

Times: Monday through Friday, 8:00 and 11:30 P.M. EST. (0100 and 0430 GCT, Tuesday through Saturday)

Sunday, 1:00 A.M. and 8:00 P.M. EST (0600 Sun. and 0100 Mon. GCT)

Starting at the times indicated, bulletins are transmitted by telegraph simultaneously on all frequencies. Bulletins are sent at 25 w.p.m. and repeated at 15 w.p.m. to facilitate code practice. Telegraph bulletins are followed, in turn, by voice transmissions, except that 3950 is substituted for 3555 kc., and 14,280 is substituted for 14,150 kc. Changes from this schedule will be announced by the operator.

Code-Proficiency Program: Practice transmissions at five speeds, 15 through 35 w.p.m., are made Monday through Friday on the above-listed frequencies, starting at 10:00 P.M. EST (0300 GCT, Tuesday through Saturday). Approximately ten-minutes practice is given at each speed. Next certificate-qualification run is scheduled for Thursday, October 17th.

General Operation: W1AW engages in two-way work with amateurs as follows:

Monday through Friday, all times EST —	
3:00 P.M.–3:30 P.M.	29,150 kc. voice
3:30 P.M.–4:00 P.M.	28,060 kc. c.w.
4:00 P.M.–4:30 P.M.	14,280 kc. voice
4:30 P.M.–5:00 P.M.	14,150 kc. c.w.
6:00 P.M.–7:00 P.M.	7250 kc. c.w.
7:00 P.M.–7:30 P.M.	3950 kc. voice
7:30 P.M.–8:00 P.M.	3555 kc. c.w.
9:30 P.M.–10:00 P.M.	3555 kc. c.w.
12:15 A.M.–1:00 A.M. (Tues.–Sat.)	7250 kc. c.w.
Saturday and Sunday (excepting dates of official ARRL activities)	
Saturday: Midnight–1:00 A.M. (Sun.)	3555 kc. c.w.
Sunday: 1:45 A.M.–2:30 A.M.	7250 kc. c.w.
6:00 P.M.–7:00 P.M.	3950 kc. voice
7:00 P.M.–8:00 P.M.	7250 kc. c.w.

CD QSO PARTY

The first postwar get-together of Communications Department appointees and ARRL officials was one of the most lively midsummer QSO parties we can remember so far as c.w. participation (ORS, etc.) is concerned. OPS and others who spent their time on voice reported 'phone participation below that of previous parties.

The scores, made under a new system, are the equivalent of some of the "million-total" scores of years gone by. Many veterans of prewar ORS and OPS Parties are still in there punching, and most of them will be found in their normal positions of leadership!

Some of the lads were hiding behind new calls. W4EOP is none other than well-known W3EOP. W4JIZ is "Vic," ex-W6KFC, W9DVO, W7IXH. W2OXX is ex-W3DVC, W3KWL is ex-W8AOE, and ex-W3IAY added to the available sections with W2OOU/VE5.

Now that all appointees and officials are eligible for the ORS and OPS Parties, we are going to call our quarterly get-together the "CD QSO Party." To encourage contacts between all members of our "official family," the separate ORS and OPS Parties will be combined into a "one-group" party. The call "CQ CD" will be tried for the first time in this party and participants will vote on the preferred call. The Fall party is scheduled for October 26th–27th. Details will reach you by mail before those dates.

C.W. Scores

Station	*Score*	*Contacts*	*Sections*	*Different Stations*
W3BES	70,145	266	51	173
W4EOP	67,066	265	49	181
W3DGM	58,652	228	50	152
W4JIZ	55,755	235	48	167
W6PBV	44,248	107	43	87
WØTQD	41,306	177	45	131
W1BFT	40,244	178	43	125
W1UE	40,189	186	41	132
W8ROX	39,346	171	43	130
W2IOP	38,392	180	41	139
W3BXE	37,758	178	40	118
W5JTC/6	36,611	95	42	71
W1EOB	36,176	149	46	112
W8UZJ	35,222	145	46	112
VE3CAR*	32,032	152	42	112
W1BIH	28,483	145	37	104
W8ONK	28,359	122	44	111
W1AW**	27,446	143	38	124
W2OXX	25,016	142	33	101
W8SCW	24,941	121	39	98
W9NCS	24,724	115	40	84
W6SID/7	23,539	73	32	52
W5NW	23,346	103	42	78
WØJNC	23,014	110	39	82
W1LLX	22,245	131	32	101
W3ADE	21,674	122	33	92
W6RFF	• 20,878	56	37	47
W2OOU/VE5	20,330	98	38	76
W1TS	20,324	113	34	94
W3KWL	20,222	122	30	122

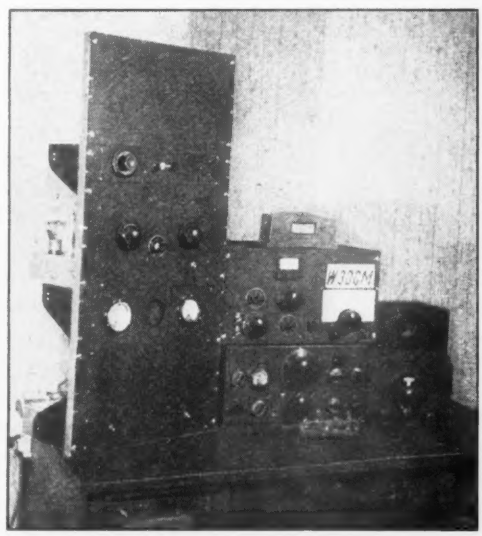
Others with scores of over 10,000: W3AVJ 19,901, W3HUM 19,881, W9YAH/8 18,725, WØJRI 18,574, W4DWB/5 18,499, W3GQW 18,378, W3JSU 18,028, W2LAO/3 17,877, W5AQE 17,531, W8HCO/1 16,712, W6IFW 14,966, W4BYF 14,733, W8AQ 13,999, W6HIR 13,617, W8TOJ 13,567, W5DWW 13,248, W2EC 12,701, W1BDI/1 11,484, W1JPE 11,483, WØVEE 11,346, W9SAG 11,130, W7JQU 10,381.

*VE3QK opr.
**W1JJR principal opr.; 29 QSOs by W1JBJ

'Phone Scores

Station	*Score*	*Contacts*	*Sections*	*Different Stations*
W4DCQ	2,973	31	19	28
W3CWG	2,358	22	16	22
W9CLF	1,226	16	11	16
W4FUM	1,214	14	12	14
W8EQN	754	16	9	16
W9SWH	525	8*	7	7
W1AW***	510	10	10	10
W4BIW	217	7**	6	7
W8JFC	216	4	4	4
W1HIL	150	5	5	5
W8MOP	144	6	4	6
W2JKH	138	3	3	3
W8NDN	105	5	4	5
W6DZE	61	1	1	1
W6FMJ	60	1	1	1

*2 contacts by c.w.
**1 contact by c.w.
***W1JBJ opr.



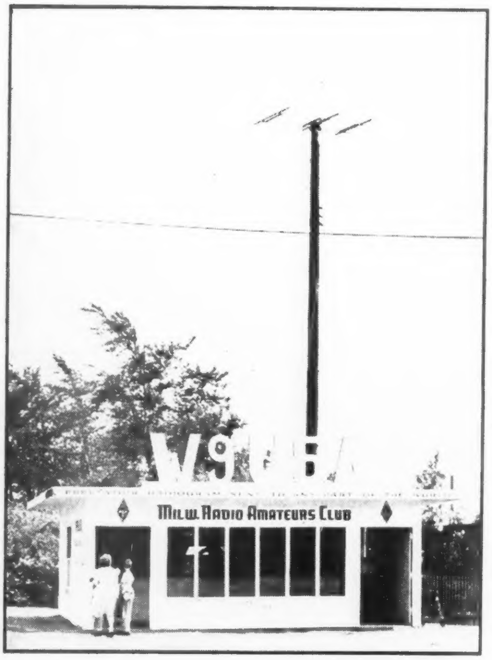
W3DGM, ORS, long-time ORS Party enthusiast and third-high in the July get-together. The SW-3 is used as a preselector for the NC-101X. The VFO unit atop the receiver uses 6SK7-6V6-807, is self-contained, running 30–40 watts input, and makes an ideal FD rig. The main transmitter is bandswitching, 3.5 to 28 Mc., with p.p. 812s, 200-watts input.

BRIEFS

Ham radio has come through again — this time in the "apartment hunting" field. W2KNP in N. Y. C., in need of an apartment in Baltimore, made contacts with the following amateurs, requesting their assistance: W3GF, W3KBX, W6OXM/3, W3JEI and W2BZB/3. Contacts were on 3.5 Mc. over a six-week period, and an apartment was finally secured, thanks to amateur coöperation.

W9USA — MILWAUKEE CENTURAMA

The Milwaukee Radio Amateurs' Club operated W9USA at the Milwaukee Centurama, which was held from July 12th to August 11th, commemorating the 100th anniversary of the city. The "shack" housing the station was erected by the Centurama committee, and was a neat affair as shown in the photo.



Ralph O. Koenig, W9RUF, MRAC president, was in charge of the project, with Al Krones, W9UIT, responsible for the actual operation of W9USA. The mainstays in handling the operating load were W9GVL, W9SQK, W9RKP, W9HPZ, W9CCD, W9LZU, and W9KCY.

Traffic was accepted from Centurama visitors, with a total of 1139 messages handled: by W9UIT 271; W9LZU 170; W9KCY 168; W9RKP 152; twenty-one othe operators, 378.

A total of 1096 contacts were made by W9USA: 7-Mc. c.w., 362; 28-Mc. 'phone, 209; 3.9-Mc. 'phone, 147; 14-Mc. c.w., 127; 3.5-Mc. c.w., 94; 144-Mc. 'phone, 93; 14-Mc. 'phone, 52; 28-Mc. c.w., 6; 27-Mc. c.w., 6. Effort was made to send QSL cards to all contacts, but because of incomplete QTHs it was not possible. Cards were sent out representing 723 QSOs with all W districts, as well as VE1, VE3, VE5, VO, TI, LU, CM, OA, TG, K4, KP4, PY and CT2. A second QSL card is being mailed showing a picture of W9USA.

The equipment consisted of a BC-610 transmitter used on 14, 7 and 3.5 Mc., a 200-watt composite transmitter on 28 and 27 Mc., two HQ-120s and two BC-312s, and a 144-Mc. receiver and HY-75 transmitter. Antennas were a 3.5-Mc. half-wave, end fed with ¼-wave feeders, several 300-ohm flatline folded dipoles for 7 and 14 Mc. transmitting and receiving, a 28-Mc. 3-element rotary beam, and a 144-Mc. J.

E. W. Kreis, W9HRM, MRAC secretary, who sent us this report, expresses the thanks of the W9USA crew for the fine coöperation of amateurs handling Centurama traffic.

CODE-PROFICIENCY PROGRAM

W1AW conducts practice transmissions nightly Monday through Friday, 10:00 P.M. EST, at speeds of 15, 20, 25, 30, and 35 w.p.m. Once each month a special transmission is made to enable you to qualify for a Code Proficiency certificate or endorsement sticker indicating progress above your first certified speed. See W1AW schedule for details on frequencies.

The next qualifying run will be on October 17th. The text transmitted on that date, received successfully by ear at the highest speed you can copy, should be sent to ARRL for checking. To avoid errors in recopying, send your original copy. *Attach a statement certifying over your signature that the copy submitted is direct copy, made from reception of W1AW by ear, without any kind of assistance, personal or mechanical.* If you qualify, you will receive your certificate, or appropriate endorsement sticker for certificate you already hold. Those who qualified in the past should submit copy only if speed is higher than indicated on certificate or endorsement sticker.

QST lists in advance the text to be used on several of the CP schedules. This makes it possible to check your own copy. It also provides a means of obtaining sending practice since it permits direct comparison of one's fist and tape sending. To get sending help hook up your own key and buzzer and attempt to send right in step with the tape transmissions. Adjust your spacing in the manner indicated as necessary for self-improvement.

Date	Subject of Practice Text from August *QST*
Oct. 1st:	*An Amateur-Band Eight-Tube Receiver*, p. 13
Oct. 3rd:	*Our Best DX — 800 Feet!*, p. 19
Oct. 9th:	*Unstable Signals*, p. 23
Oct. 11th:	*An Inexpensive 3-Element Beam for 28 Mc.*, p. 27
Oct. 15th:	*It's Fascinating Work*, p. 32
Oct. 17th:	Qualifying Run, 10:00 P.M. EST
Oct. 18th:	*Permeability-Tuned Oscillators*, p. 42
Oct. 21st:	*Raising the Efficiency of the V.H.F. Linear Oscillator*, p. 48
Oct. 23rd	*For Beginners Only*, p. 53
Oct. 28th:	*The World Above 50 Mc.*, p. 66
Oct. 31st:	*Speed-Key Adjustment*, p. 76

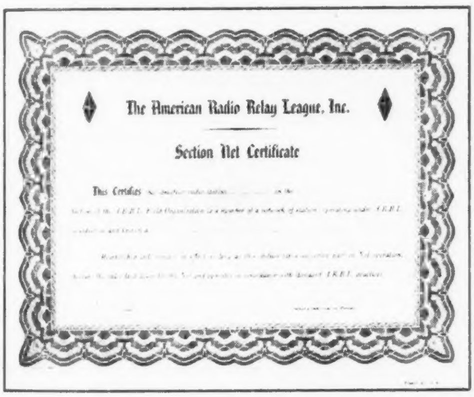
BRIEF

W9DGA's first VK QSO was VK3XK, his second VK3KX.

TRAFFIC PLANS

As announced in May *QST*, we have been working on a master frequency plan to provide for the operation of 3.5 Mc. traffic networks. A channeling system has been devised to allow maximum use of the available frequencies with a minimum of interference. This plan is predicated on the assumption that nets will operate on 5 kc. points, starting at 3525 kc. (the upper limit of the 3.5 Mc. emergency-calling segment). We urge traffic organizers to keep this in mind. C.w. nets should confine operations to the lower 300 kc. of the band to avoid interference with stations operating in the newly-expanded U.S. and Canadian 'phone bands. By sharing of frequencies among nets geographically isolated from one another and carefully timing the schedules of those located within interference range, several nets may be accommodated on the same frequency.

In meeting our objectives the utmost coöperation of all will be required. The initial channeling has been accomplished, based insofar as possible on frequencies employed by established nets prior to the war. All SCMs, RMs, and PAMs will receive a copy of this initial plan for comment. In the case of nets using frequencies not registered with ARRL, it is important to notify us of your net plans, giving the proposed frequency and times of operation. Reference to our master net register will allow us to determine whether you will run into interference with other nets that will be resuming operation. We'll add your own net to the plan and advise other network organizers of the best frequencies and times to choose for their operations.



This is the season when ARRL organizers are making plans for formation or resumption of Section Nets. Under the leadership of Route Managers, traffic nets are operated in practically every Section. Phone Activities Managers may organize networks for contact and fraternal purposes. There is much satisfaction in being part of a well-conducted net. ARRL nets have a nucleus of high-class well-operated stations (ORS-OPS), insuring "tops" in enjoyable operation. For the most part, nets organized by RMs and PAMs work in the 3.5-4 Mc. band, usually on a spot frequency. All amateurs are invited to participate, whether or not they hold appointments. The certificate shown here is issued to each active station by the SCM. It is a pleasure to operate with an objective and to work with a group of fellow amateurs toward a common goal. You get all this in network operation. Get in touch with your RM, PAM, or SCM at once to determine what plans are being made in your Section. Line up your station for the maximum in operating enjoyment and effectiveness.

General Traffic Period & Channels

To facilitate movement of messages from stations that wish to send an occasional message, but that are not affiliated with traffic nets, and to enable regular traffic-handlers to pick up such messages, we recommend a daily General Traffic Period, 6:30-8:30 P.M., your local time. In this connection, our frequency plan provides for the frequencies 3575 to 3600 kc. to be used as *general traffic channels*. All members of organized networks and official appointees are requested to work general, when possible, during this period, and to monitor the *general traffic channels*. In this manner operators who are unable to maintain regular schedules or whose operating time is limited may get on the air during the General Traffic Period and clear their traffic through ORS, TLS and others who keep schedules on established traffic routes. Make use of this arrangement to further delivery of traffic and dependability of service. Directional CQs also will be found useful during this period.

To coördinate all amateur traffic-handling activities and make best use of facilities available, the Communications Department requests that all amateurs having good traffic connections with points outside the U.S., or who have transcontinental schedules, notify us of same. We want information on all *reliable* traffic routes, outlets and schedules. Let's start off postwar traffic activity with a bang!

Become an ORS

This will be an interesting season for traffic! Every amateur station, operated by an ARRL member who is interested in traffic work and worthwhile operating-organization activities, and who can meet the qualifications, is eligible for appointment as Official Relay Station. Brass-pounders handle traffic because they enjoy such work! Get in on the fun of keeping schedules, taking part in Section Net activities, and associating with good operators. Become an ORS! Write ARRL for details on how to qualify for appointment.

TRUNK LINES

In prewar days ARRL Trunk Lines worked on spot frequencies to provide speedy and reliable traffic movement during each active radio season. These "main line" routes were laid out East-West and North-South and connected with local networks and overseas points. Functioning at high efficiency, they were the backbone of the

ARRL message-relaying organization.

The Trunk Line System currently is in the process of complete overhaul. There is much to be done before the lines can operate with the same precision as they did in the prewar period. Many reliable stations will be needed to hold down trunk positions. Already we have many requests from traffic-minded amateurs for appointment as TLS. We are anxious to appoint every interested traffic-handler who is located where he can fit into one of the routes. Our aim is to have the best possible system in operation by the time the fall operating season is in full swing. Former trunk-line stations will be given first consideration. If you previously held appointment, and desire to resume activity as TLS, please *get in touch with ARRL as soon as possible.* Other amateurs who wish to be placed on the list of TL candidates should likewise write or send a radiogram to Hq., indicating their interest. The qualifications are not simple. Applicants must be ORS. Ability to work in the 3.5-Mc. band with good signal coverage is prerequisite and you will be required to maintain schedules at least five days per week. It is important, too, that you have good outlets to and from organized networks in your area so that incoming and outgoing traffic can be handled with a minimum of delay.

The Trunk Lines long have been the pride and joy of our whole ARRL traffic set-up. We are anxious to continue their reputation for reliability. If you are genuinely interested and can meet the qualifications, let's hear from you just as soon as you read this, OM! Address your inquiry to National Trunk Line Manager.

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OLD TIMERS CLUB

June *QST* invited applications for the ARRL Old Timers Club (formerly called 20-Year Club). The present-day calls of those who have so far received membership certificates are listed below according to the year in which their first amateur licenses were received. There appears to be plenty of life left in these OTs!

Any member of the 20-Year Club who has not received a certificate of membership under the new name is requested to send us a postal stating that he is a member and giving present call and date of first amateur ticket. He will then be added to the new OT Club roster.

The Old Timers Club is open to any operator who holds an amateur call at the present time, and who held an amateur license (operator or station) 20-or-more years ago. Lapses in activity during the intervening years are permitted. If you can qualify, send us a brief chronology of your ham career, being sure to indicate the date of your first amateur license (year and month, if possible), and your present call. If you are found eligible, you will receive one of the attractive certificates. Address all correspondence to the Communications Department.

1912: W2BO W5GNF W9YBS

1913: W1CK W1DIU W1EH W1FPP W1GDY W1GS W2FH W2PC W6GYV W6LFD WØCVU KP4KD

1914: W2BR W2DYT W2ZI W3DRO W4GVC W6AVT W6DEP W6GS W6IJ W6OZY W8AAF W8FRY W8QDU W9TEB

1915: W1MU W2HCO W8AL

1916: W1BHM W1HGX W1KWH W1MLT W1OGF W2ELN W2OCH W2OYU W2RNH W6NQI W6QE W6QYI W7DXV W9CS W9OSQ W9VKF W9WZE WØDGM

1917: W1BB W1JFN W2IP W2PF W2RA W6ANM W8APD W9AEP

1919: W1BPH W1JXE W1MD W1RP W2CJX W2KPU W2OC W3HH W4WT W8AYS W9AHP W9GNU

1920: W1BDV W1DF W1NKW W1OMT W1TS W1ZL W2AWW W2BEI W2GVZ W2LWZ W2PHO W3HBZ W3KP/W4ES W5HF W6MRT W6PB W6RNO W6SVF W6TI W6TTS W6ZCN W7HIZ W8CUZ W8GER W8JDV W8VBM W9EVG W9LFK W9VD WØUXI

1921: W1BDI W1BVR W1LLX W1MOK W1OJH W2BLP W2DJT W3FRS W3JB W3JW W3VT W5BAM W6APE W6MHZ W6MJB W6MKW W6TNH W8GGA W8JWC W8MPG W8MRD W9ASN W9BUK W9DZG W9EWH W9IFS W9IND W9JIW W9OAB W9SV W9ZNN G2HG G5LH KP4AZ XE1KE

1922: W1AIJ W1MCT W2BCL W2CMX W3CDQ W3IHG W3NUG W3WU W4AAR W4IVJ W4MS W5AHD W5CVA W5HUT W5WR W6CAG W6NKM W7AIE W7CE W7KK W8BN W8ERE W8TKZ W9AC W9ACM W9BRX W9NHN W9NZZ W9VBR WØGBJ VE3OI VE5AC VK5BF

1923: W1AH W1BAV W2ADC W2ARP W2BEZ W2JA W3ADE W3AQM W3IKS W3QP W3VD W4KL W5AJG W5NW W5RZ W5WX W6AAE W6JDN W6JTN W6VPF W7FGB W7GXP W7HJZ W8KPL W9AKP W9BRY W9FUR W9PNH W9YS/W9YOL W9YZN WØAQO WØCCE WØEIT WØVEE VE2WM VK4DO

1924: W1AL W1ALP W1AY W1CJD W1KZT W1MFC W2KHM W4IJQ W5AUB W6LMY W6SGZ W8AVH W8BSR W8FJN W8FMU W8WMJ W9AQI W9BQZ W9WR WØDIB WØWO VE3EF

1925: W1AQT W1BFT W1BZJ W1EPC W1LSR W1UE W2ANN W2ARO W2CC W2CW W2KS W2MV W2NIY W3CVJ W3EVW W4KG W4QT W4TK W4TZ W5ABM W6DIT W6HG W6LN W6MQR W6MUF W6SBD W7JHS W8GBF W9ANB W9CRA W9DCD W9JPX W9UC WØAWP WØBVU G5BY VK2NS

1926: W1AJ W1TD W2AXP W3AQN W3ASW W4AIL W5AQN W5HTL W8DED W8JV W9AJU W9DAR W9ECK WØDBC

—•••—

NORTH CAROLINA-VIRGINIA FIELD DAY—OCT. 5TH-6TH

The Raleigh Amateur Radio Club announces a Fall Field Day for all amateur radio clubs in North Carolina and Virginia. Patterned closely after the ARRL FD, the Raleigh club's affair has a twofold purpose: (1) to increase interest and activity in FD operation and familiarize members with auxiliary operations, and (2) to establish closer ham relationships between the various clubs participating and between Virginia and North Carolina amateurs.

The activity will run from 6:00 P.M. EST, Saturday, October 5th, to 6:00 P.M. EST, Sunday, October 6th. Any and all authorized amateur frequency bands may be used. Portable stations operated in the field (away from "home" address) are eligible to submit scores. Other interested amateurs are urged to coöperate. For credit, all station control points at a Field Day station must be within 500 horizontal feet of some given point.

Scoring: Virginia clubs will count 1 point for each contact with stations outside North Carolina; 2 points for each contact with other Virginia clubs participating in the event; 3 points for each contact with North Carolina clubs participating in the event; and 2 points for each contact with other North Carolina stations.

North Carolina clubs will count 1 point for each contact with stations outside Virginia; 2 points for each contact with other North Carolina clubs participating in the event; 3 points for each contact with Virginia clubs participating in the event; 2 points for each contact with other Virginia stations.

Multipliers: The following multipliers apply to contact points, if frequencies used are below 30 Mc. — 1 for power input to final stage of over 100 watts; 2 for power input in excess of 30 watts, but not over 100; 3 for power input not over 30 watts. These multipliers shall be *doubled* for all contacts made above 30 Mc. An additional multiplier of 2 shall be used, if either transmitter or receiver is operated on auxiliary power, 3 if *both* receiver and transmitter are operated on auxiliary power.

Message credits before multiplier will be allowed as follows, if copies are submitted with log: 25 points for radio origination of not more than one message addressed to ARRL Hq. This message shall include number of operators, location, conditions, power. One point may be claimed for radio handling of each FD message of another group (½ point for receiving, ½ point for relaying).

Reporting: All reports, to count, must be mailed on or before October 20, 1946, to Raleigh Amateur Radio Club, c/o W4AVT—FD Committee, 2110 Reaves Drive, Raleigh, N. C. Score claims must be shown as the sum of points for each set-up. A station-worked list for each band must show contact times for each contact. A statement covering on-off times for bands and transmitters is required. State the maximum number of transmitting units in simultaneous operation at any time. The final tally of results will be compiled jointly by FD Committees of the Raleigh club and the Richmond Amateur Radio Club.

—···—

Ed Day, who will be remembered by old AARS members as one of WLM's best operators, is now in the Philippines. He reports that his new call, KA1AW, was especially selected by him to keep our traditional call, 1AW, on the air from the Orient.

ELECTION NOTICE

(To all ARRL Members residing in the Sections listed below:)

You are hereby notified that an election for Section Communications Manager is about to be held in your respective Sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the Section concerned, in good standing, are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been a licensed amateur for at least two years and similarly a full member of the League for at least one continuous year immediately prior to his nomination.

Petitions must be in West Hartford, Conn., on or before noon on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, and station call of the candidate should be included with the petition.

The following nomination form is suggested:

Communications Manager, ARRL (Place and date)
38 La Salle Road, West Hartford, Conn.

We, the undersigned full members of the............
.... ARRL Section of the................
Division hereby nominate...........................
as candidate for Section Communications Manager for this Section for the next two-year term of office.

Elections will take place immediately after the closing dates specified for receipt of nominating petitions. The Ballots mailed from Headquarters to full members will list in alphabetical sequence the names of all eligible candidates.

You are urged to take the initiative and file nominating petitions immediately. This is your opportunity to put the man of your choice in office.

— *F. E. Handy, Communications Manager*

Section	*Closing Date*	*Present SCM*	*Present Term of Office Ends*
Eastern New York	Oct. 1,1946	Ernest E. George	Oct. 15, 1946
Nebraska	Oct. 1, 1946	Arthur R. Gaeth	Oct. 15, 1946
Northern Texas	Oct. 1,1946	Jack T. Moore	Oct. 15, 1946
South Carolina	Oct. 1,1946	Ted Ferguson	Oct. 16, 1946
Philippines	Oct. 15, 1946	George L. Rickard	Oct. 15, 1938
Mississippi	Oct. 15,1946	P. W. Clement	Apr. 1, 1945
Rhode Island	Oct. 15, 1946	Clayton C. Gordon	Apr. 15, 1945
No. Minnesota	Oct. 15,1946	Armond D. Brattland	June 15, 1945
San Diego	Oct. 15, 1946	Ralph H. Culbertson	Apr. 15, 1946
Maine	Oct. 15,1946	Grover C. Brown	June 15, 1946
Oklahoma	Oct. 15,1946	Ed D. Oldfield, jr.	Aug. 15, 1946
Kansas	Oct. 15,1946	Alvin B. Unruh	Oct. 29, 1946
*Maritime	Oct. 15,1946	Arthur M. Crowell	....
*Saskatchewan	Oct. 15,1946	Arthur Chesworth	....
West Indies	Oct. 15, 1946	Mario de la Torre	Deceased
Oregon	Nov. 15,1946	Carl Austin	Nov. 22, 1946

* In Canadian Sections nominating petitions for Section Managers must be addressed to Canadian General Manager, Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws, electing the following officials, the term of office starting on the date given.

Montana	Albert Beck, W7EQM	June 1, 1946
Northern New Jersey	John J. Vitale, W2IIN	June 17, 1946
Idaho	Alan K. Ross, W7IWU	June 17, 1946
Quebec	Gordon F. J. Phelan, VE2SU	Aug. 15, 1946
Tennessee	James W. Watkins, W4FLS	Aug. 15, 1946
Ohio	William D. Montgomery, W8PNQ	Aug. 17, 1946

SCM — AEC — ORS — CP — SEC — OBS — TLS — OO

PAM — WAS

Station Activities

NETS — WAC

OES — A1OPR — EC — DXCC — CLUBS — RM — OPS — RCC

• All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — 3QP schedules VE8MR, a weather station on Resolution Island, and OA4U. 3GMK's v.f.o. conked out in the ORS Party and he finished with crystal. 3ADE enjoyed himself in the ORS Party. 8QEW, Scranton, now is 3QEW. New hams in his area are 3KLZ and 3KGB. 3KKP is new ham in South Langhorne. He operates on 3.5-Mc. c.w. 3EVW worked VS9AN and 9HJW/Saipan with 400 watts to an 813 on 14 Mc. 3BRZ is working DX on 14-Mc. 'phone with a 300-ohm line folded dipole. 3DGM operated all through the ORS Party with an infected ear but got 230 contacts! 3BXE is on with a new rig using an 809. He worked five continents with his 807 doubler. 3GQW worked VS7JX on 14 Mc. with 40 watts input. 3FLH is on 14 Mc. with a pair of T55s. 3GHD is having antenna trouble these days. 3GHM's NC101X folded up during the ORS Party. 3JSU surprised us all with a fine performance in the ORS Party. ØEHR/3 is setting up a fine station, 'phone and c.w., 250 to 500 watts. 3IPC put up a new three-element beam for 28 Mc. at his new QTH. 3KT is resorting to directive antennas in order to snare some of the rare DX on 14 Mc. The Frankford Radio Club now holds the call W3FRY as a memorial station to the late Jim Hodgman. 3EVT, famous DX hound from Virginia, "boiled the Owl" at 3BES over the week end. 3HFD is on 14-Mc. 'phone mostly these days and has over fifty countries to his credit. 3BES has over ninety on 'phone and c.w. 3HA is ex-8GV and 3ZN is ex-3HRE, both old ORS. There are thirty-three ORS/OPS in the section now. OPS activity is at a very low ebb. 3AQN had a very swell write-up of his station in a local magazine. 3BBV is a new OO. Activity reports are on the increase but could be improved upon. The ORS/OPS Party brought a lot of the old-timers. 3EU is ex-8EU. 3CAU is interested in OO work. ØFSA/3 is a new ham in Philadelphia. Traffic: W3QP 18, 3BXE 6, 3BES 5, 3KKP 1. 73. *Jerry.*

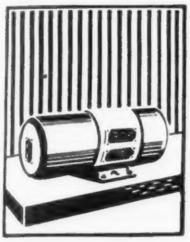
SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W2GCU — Section EC: 3BAQ. ECs: 3ABS and 3JNZ. Please send ORS/OPS reports by the first of each month. When you send your prewar ORS/OPS certificates for endorsement, please advise us of your ARRL membership expiration date. 3HWO and 3FNL are heard regularly on 28 Mc. Bob is using a BC-348-Q and Joe an HQ-129-X. 3GEV moved to Mortonville, Pa. 2AQW is building rig for full kw. 'phone and c.w., all bands. 3FXN is on 3.5-Mc. 3AIR is on 50 Mc. in vicinity of Silver Springs, Md. 3GRW grabbed off a brand-new Army surplus Hammarlund receiver. 3EUH has worked several Cubans on 40 cross-band on 3.5-Mc. 3EED received commercial telegraph first, and telephone second-class tickets. Ex-3BAP bought a Navy RAK receiver. 2IJC has been working 3.9-Mc. 'phone. 2PBR is working 3.5-Mc. from his new QTH in Englishtown. 3GQX is building for 14 Mc. with a view to scheduling his son, ex-3FMU, who will sign KL7 on 28 Mc. from the Aleutians. 2OVO is operating portable 3.5-Mc. 3AHN is on 144 Mc. 2QHM is on 3.5, 28, and 144 Mc. 2PLD migrated to 14 Mc. to work some D4s. 2PFQ has eight-element beam. 2OQH and 3CKA are pumping out on 28 Mc. 2OTI upped his power almost double. 2OQH has forsaken c.w. for 28-Mc. 'phone. 3AVJ was heard working cross-band 3.5-Mc. c.w./27-Mc. 'phone. 2ORN doubled power to 50 watts on 3.5 Mc. The *SJRA News* will add a new department in the form of a UHF/VHF section by 2PAU. 3BM holds the S.N.J. h.f. records with his 144-Mc. QSO with Harwich, Mass., 300 miles, using a TR-4 with 8 watts and coax antenna on a 68-ft. steel mast. On the u.h.f. 3BHB uses a 6J6 with 4 watts and indoor antenna and worked 3JDF, Holy Oak, Del. 3GOI is looking for contacts on 50 Mc. 2PBW is working on 2300 Mc. 3UK has sixteen-element rotary beam for 144 Mc. 3FWP and 3JZR have new mobile rigs on 144 Mc. Additional new W2s: 2QCM, ex-3HYT, 2RDK/8JSU, 2QZF/3IFT, 2QHM/3GZS, 2PPI/3FAF, 2PLD/3GLZ, 2QLM/8TEO, 2OZO/3ILX, 2CEU/3CEU, 2AQM/3AQM, 2APB/3APB, 2QCU/3JAU, 2QGZ/3AFH, 2QKY/3JOL, 2QCC/3HVO, 2QUH/3CCC, 2QLP/3IDY, 2GPS/3GPS, 2EFF/3EFF, 2PYH/3BXA, 2FBC/3FBC, 2RLY/3GQX, 2QKI/3JWX, 2IMA/3IMA, 2QVH/3HOH, 2BEI/3BEI, 2PWD/3EPF, 2QOC/3BPH, 2EZM/3BYK, 2QPZ/3IFV, 2PTM/3COT, 2PRG/3GPU, 2PSZ/3JNZ, 2PWD/3EPF, 2ZX/3ZX, 2BGP/3BGP, 2HV/3CES, 2PSY/3EPN, 2BQO/3BQO, 2DMU/3DMU, 2DBD/3DBD, 2PRG/3GPU, 2JAV/3JAV, 2PPW/3AUA, and a new call, 2QJO. Traffic: W2AQW 7, 2PCF 6. 73. *Ray.*

WESTERN NEW YORK — SCM, Charles I. Otero, W2UPH — PWY was vacationing in the Adirondacks and heard sad news about the family in town. Not being able to get through on the land wire he called Rochester anxiously on 3.9-Mc. 'phone with 20 watts. MRO picked him up and called for a clear channel. ECM was in QSO on the frequency and promptly signed and offered to help. UPH called in and, with the help of ECM and MRO, PWY's message was received, delivered, and a reply sent back assuring him that everything was OK at home. Heard on 144 Mc. in the Rochester area are 8RTB, OTW, OWF, 8DJW, TXB, TWM, OXK, WKE. 8NOR and SJV would like to contact the Rochester gang on 144 Mc. from Buffalo. A Buffalo-Rochester-Syracuse network on 144 Mc. is now possible. The newly-elected officers of the Sydney Amateur Radio Club are 8LUR, reëlected pres., 8UPT, reëlected treas., and 8KKP, secy. The Club held an interesting DX contest for its members, paying cash prizes for the best ten contacts. 8TEW and 8LUR are mostly on 3.9-Mc. 'phone. 8FOB works 'phone and c.w., also 8UPT. 8SYN and 8KKP are strictly c.w. The Club took part in the Field Day and made fifteen contacts with about 18 watts on c.w. 8APD bought three ARRL *Handbooks;* he sent one to Shanghai, one to Poland, and one to Denmark. 8SJV reports the following: 9HHM worked portable-mobile on 144 Mc. in the Niagara Frontier; 3GIO QSOed QAG, PBU, and NOR on 144 Mc. from Darian Center; SZK is looking for traffic on 3.5 Mc. c.w.; FMH is rebuilding with a pair of V70Ds in final; VE3BBH led a discussion on antennas at the Niagara Falls Radio Club meeting; NW is back on 3.9 Mc. after a vacation; NOR worked five Erie, Pa., stations, 3AQY, KKJ, NBV, NMP, and KKT on 144 Mc., also his first WØ on 50 Mc.; AYN jumps up on 144 Mc. when 3.9 Mc. gets too hot; PRI, SBN, DHZ, HQC, and SIC are back on the air; UHI and PZJ are rebuilding for high power; SB is EC at Dunkirk (an EC is needed in each locality; contact SJV or UPH); QLK and IIE have new 6IOEs; GHU and NNP are on 3.9 Mc.; NOR, OUJ, IRU, PZL, and SJV work portable-mobile on 144 Mc. 8WKE/2 reports operation on 3.5-, 7-, and 14-Mc. c.w. and 3.9- and 28-Mc. 'phone. His transmitter, which is a low-power compact rig, running 6V6GT crystal oscillator, 6L6GX final with 30 watts input, modulated with 6N7 Class B, 6N7 Class A driver, and 6AU6 microphone preamplifier, is now complete except for a temporary modulation transformer. Traffic: (June) W8WKE/2 4. 73. *Charlie.*

WESTERN PENNSYLVANIA — SCM, R. R. Rosenberg, W3NCJ — Section EC: AVY. RMs: TOJ, KWL, KWA. TOJ reports Western Pennsylvania ORS net activity for July; twenty net sessions held, fifty-one messages handled, and following stations participating: AXD, KWL, HKU, KQD, TXQ, TOJ, and KSQ. BOZ is installing 28-Mc. transmitter in his car. VMW, PMY, RMM, and BOZ have received their old calls with numeral "3." NDE writes that the Boys' Club of St. Marys station is 3KYR. KQD

(*Continued on page 66*)

{Number one hundred fifty-one of a series}



PROBABLY the most interesting feature of amateur radio at the present moment is the large quantity of surplus government equipment that is being offered for sale. Most of us have spent a good many hours poring over the displays of wartime gadgets and weighing values. It combines all the fun of bargain hunting with the best features of a mystery thriller — for what in heck some of those gimmicks were ever used for only the Army knows, and the Army has probably forgotten.

As you have probably discovered, the items that are priced really low are the ones that are so specialized that they have no peacetime use, apparently. These are the ones that are fun, because ingenuity really pays off. For instance, there are a number of aircraft servo units currently selling for less than $15.00 new, though they may well have cost the government fifty times that figure. This gadget consists of two units, one of which is a compact assembly of a hydraulic pump, motor-driven, a pair of solenoid valves and a hydraulic piston geared to rotate an output shaft. This is just what the doctor ordered for turning a beam antenna. It even has a self-contained, thermostatically-controlled heater to keep the unit from freezing in winter. The second part of the unit is a control box full of gears and electrical parts, including electrical equipment such as might be used as a remote indicator to show where the antenna is aimed. We have not figured out how to do it yet but we plan to have a lot of fun trying.

There are so many different surplus items that there is not much use in trying to review them here. However, dynamotors are available in large quantities and they are useful in portables. Many of these are for operation on 12 or 24 volts which is highly inconvenient, and most take so much current at rated load that they would run down a car battery very quickly, but they can be operated very satisfactorily at reduced input.

One type offered by many jobbers is designed to run from either a 6 volt or 12 volt battery. It supplies 160 ma. at 500 volts and draws 22 amperes from a six volt battery. Even at no load it draws 5¼ amperes. However, if you connect the armature for 12 volts but run it on 6 volts, and run the six volt field direct from the battery, the no load current is 3 amperes. With an output of 80 ma. at 255 volts, the drain is about 7 amperes. This is better efficiency than the small dynamotors intended for this output. Furthermore, in emergency you can step up power by throwing a switch.

The dynamotors intended for 12 volts only can be operated at 6 volts if the two field coils are connected in parallel instead of in series. (Watch your polarity!) This cuts the output voltage in half, of course. It makes a very sweet-running, efficient unit with which power can be increased when necessary.

A parallel connection for the field coils will usually let you run 24 volt dynamotors on 6 volts. This provides half the normal ampere-turns in the field but should cause no trouble if the output current actually used does not exceed one-half the rated current. Of course, with only a quarter of the normal input volts to the armature, you will only get a quarter of the normal output volts. However, many of these jobs are intended to deliver a thousand volts or more so you still get 250 volts. This should do very well for your portable and will not punish your battery too much. And if the day should come when you really have to push out a signal, when the wires are down and the river's high, then you can borrow some extra batteries and really sock power into the old rig.

DUD CAMPBELL

(*Continued from page 64*)

formerly EYY, is a member of A-1 Operators Club. AOE has been issued new call, KWL. HKU reports that UAJ is on the air with pair of T40s. KEW, MIE, and UVM are active Meadville stations, according to KEW. MJK keeps 5 A.M. traffic schedule with 4PL, 2CGG, and 1BDU. During month of July BWP worked 25 countries on 14 Mc., using three-element beam antenna and home-made receiver with 1852 and 1853 tubes in r.f. stages of 12-tube superhet. PUT is on the air. VNE is rebuilding for 28 and 14 Mc. SZU is on with 35Ts in final. RAT, SKH, and DXN are on 14 Mc. RIS is QSYing to 14 Mc. after working nice DX on 28 Mc. For 28 Mc. he uses four-element beam and for 14 Mc. a two-element beam antenna, running about 800 watts input on both bands. WKD maintains sehedule with W8QEN/CT2. BWP reports that W8SIR/VP9 puts strong signal into Pittsburgh on 14 Mc. At August 4th PARCC Hamfest, traffic and net problems were discussed during meeting held by following ORS members: KWA, KWL, KQD, TXQ, NDE, KXP, CKO, VYU, TOJ, and PER. NBV and WBM are using crystal-control with 815 tube in final transmitter stage. On July 13th contact with 8NOR at Cheektowaga, N. Y., 100 miles from Erie, was made on 144 Mc. by following Erie stations: AQY, NBV, NMP, KKJ, and KKT. Again on August 5th, with band open for DX, contact was made with 8NOR by GV, NBV, NCJ/3, KKJ, and WBM. NCJ/3 was operating portable-mobile from car on hill southeast of Erie. NMP, of Erie, is OPS and handled incoming traffic for the SCM. Other Erie stations heard on 3-9-Mc. 'phone are SLC, SJX, and VHP. Traffic: W8TOJ 60, 3MJK 34, 8HKU 24, 3KQD 24, 8BWP 4, 8AXD 2, 8NMP 2. (June) 3MJK 27, 8KXS 2. 73. *Ray*.

CENTRAL DIVISION

INDIANA — SCM, Ted K. Clifton, W9SWH — AB has a "boughten" receiver — a BC-348-Q which he uses with converter on 50 and 28 Mc. ZYK has a new mast up for his beams. EGQ is off until he gets more parts. HDB, DLI, and RHL worked fifteen miles north of Milwaukee on 144 Mc. RHL has worked over 100 miles with 9 watts to his portable-mobile rig on 144 Mc. SNF is building a new 600-watt amplifier with modulator. DUT has new 250-watt job finished. MVZ is working out on 14-Mc. 'phone with a low doublet (c.w.) and has a kw. to a 4-250-A. PBS is gathering parts for a rotary 8JK. EBQ has a three-element beam on 28 Mc. and is planning a two-element beam for 14 Mc. TIY is back in this section again. Where? The North Eastern Indiana Radio Club is active again. EGV has lost his key so spends all his time on 3.9 Mc. QRMing the boys. He is most interested in the AEC. 6PKM/9 worked a VK on 7 Mc. QLW has new beam on 14 Mc. DGA is using 30 watts on 7 Mc. with good results. EHU put up twenty antennas on 14 Mc. in one week. (He will publish book on antennas soon.) ERN has new rig which sounds FB. MOK will have rig going for the fall season. UIA has WAC and has worked a number of states on 50 Mc. BLF is on 3.5-Mc. c.w. GGP has been on the same frequency, 14290 kc., since 1934. YWE is now at WHOT, South Bend. He is using a 616 on 3.5-Mc. c.w BKH is new OPS. NGS is to be on with new antenna on 3.5 Mc. which will be a vertical 1/8-wave, top-loaded. He now has his portable rig on 3.5 Mc. SAG soon will leave us after receiving his Master's Degree in E.E. at Purdue. After seeing the score he made in the ORS Party in nine hours I could not understand why I mailed my score in to Headquarters. NZZ is on with e.c.o. on 3.5, 7, and 14 Mc. Gramps, DLI, is said to be on 3.5 Mc. now. LSX reports for the Delphi gang. Traffic: W9DHJ 4, NZZ 2.

KENTUCKY — SCM, Joseph P. Colvin, W5IEZ/4 — 3FWV now is a 4 in Ashland. 9NGN is operating KLUF, Galveston, Tex. 9EPI has a new transmitter. 9PWB is working at WLEX, Lexington. Lt. Col. 9HAX is in Frankfort, Germany. 4IQY is active in Mayfield. 9WM1/4 is active on 28 and 50 Mc. in Raleigh, N. C. 9TXC has three mobile rigs in his car: No. 1, 2-8 Mc.; No. 2, 235 Mc.; No. 3. 21-30 Mc. 9JYL/KH6 wants Kentucky hams to listen for him on 28.5 Mc. Jack is at Hickam Field with 150 watts and a three-element beam. First Louisville-Lexington 28-Mc. QSO: 9QLF/4 and 9LNU, 43 minutes, July 15th, 75 miles. 9MRF, LNU, and 4JEB hold scheduled QSOs with 9WUC, Indianapolis, Ind., 90 miles airline. 9YXF and MRF have new 28-Mc. beams. 9LPB is recovering after a long spell of sickness. 4RBN, who reënlisted as captain,

(*Continued on page 68*)


ONLY HAMMARLUND RECEIVERS HAVE THIS FEATURE...
UNITED STATES PATENT OFFICE
2,222,043
2,222,043
SELECTIVE WAVE TRANSMISSION
Donald K. Oram, Forest Hills, N. Y., assignor to The Hammarlund Manufacturing Company, Incorporated, New York, N. Y., a corporation of New York
Application June 28, 1939, Serial No. 281,612
8 Claims. (Cl. 178—44)
This invention pertains to electrical apparatus and circuits of the type known as filters and more especially to such apparatus and circuits of the type referred to as band pass filte
incorporated in such receiver to such a degree as may be found necessary, and to make such reduction quickly and to a predetermined degree.
HQ·129·X
Hammarlund
HQ-129-X
The variable crystal filter used in the "HQ-129-X" and the "Super-Pro" is an exclusive Hammarlund patent. It provides wide band crystal selectivity for use in crowded amateur phone bands and single signal code reception.
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MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

(*Continued from page 66*)

is headed for Germany, via Ft. Monmouth. 9MWR is temporarily at Oak Ridge, Tenn. 9ALD has a new beam on 28 Mc. KYN, temporarily inactive, should be hitting on all six (at least) by this time. 4TFK, 4NGZ, 8JVI/4, 9FZL, and 9KVE are holding up their end Down State. The SCM wishes to thank his many friends for the kindnesses shown during his recent illness. 9NJY and 4IUP are still in QSO. Kentucky hams: Please send me the name, address and call of every active ham you know in the State. The ARTS meets at Canary Cottage, second Saturday of month, 6:30 P.M. Other clubs, please give me your meeting information. Traffic: W4IQY/4 14, 9BAZ 5. 73. *Joe.*

MICHIGAN — SCM, Harold C. Bird, W8DPE — 8NLV finally has an oscillator running. 8NQ has been working 7 Mc. but expects to be back on 3.5-Mc. soon. 4IIP is working in QMN net (3663 kc.) from Lansing. 8TBP gets on week ends. 8SOX is old 9EXT. 8MCB is spending considerable time with experimental television. 8KPL is on with 20 watts on 3.5 kc. 8DUA calls our attention to an error. He is secretary-treasurer of the Kalamazoo Radio Club, not the president. The president is 8YIA. 8GQF has his old letters with the new 8 symbol for the Upper Peninsula. 8YCT is located in Rochester, Mich., and can be heard on 3507.5 kc. 8AW received his SWL card from New Zealand, giving him a very good report on 3.9-Mc. 'phone. 8LHH reports 8YDR and 8YJF new-comers to Wayne and ham radio. 8YHA has been doing fine work on 3872 kc. with ten watts and reports working the sixth district. 8DED is working on 28 Mc. 8SWF now has his BC-610 on the air and is working hard to get his 28-Mc. net going. 8EGT is on 28 Mc. using 807 in final with "V" beam antenna. 8MCV is on QMN and looking for traffic his way. 8OXM is working 28 Mc. 8KNP can be heard on 7 and 14 Mc. 8UFS is on 14-Mc. station located at WCAR plant and has new three-element beam going up on 60-foot pole. 8CSL is working low power on 28 Mc. and is enjoying the Oakland County Radio Club meetings. 8ZAI is newcomer to the amateur ranks. 8YDT spends his time experimenting with v.h.f. beam antennas. 8UMI schedules Lakewood, Ohio, nightly on 14,500 kc., also 8WJC same time. He is running 60 watts on 829 three-element beam superhet 13-tube receiver. He also has 28-Mc. mobile rig. 8FQW spends his time copying code. 9ZBN constructed the filter recently described in *QST*. He is working on antenna coupling. 8TZD reports 8PHO back from the Army and combined stations at same location, building all-band transmitter. 8RJC can be found on 7 Mc. 8GQZ reports running only 10 watts but working Georgia, Kentucky, and Iowa. 8RXR can be found on 3.9-Mc. working 'phone. 8SAY has been trying 7 Mc. and reports doing fairly well down there. Jerry has ORS appointment again. 8UCG reports lots of coöperation on Field Day. 8URM has been working 7 Mc. since opening up. 8ONK, 8WWL, 8SCW, 8FX, 8FPK, and 8TRP report. Traffic: W8DAQ 128, 8UGR 103, 8SCW 41, 8TBP 30, 8TYE 26, 9GJX 25, 8FX 21, 8KNP 19, 8DPE 18, 8URM 14, 8TRP 7, 8ONK 6, 8RJC 5, 8KPL 3, 8YHA 2, 8MCV 1. 73. *Hal.*

OHIO — SCM, Carl F. Wiehe, W8MFP — 1ONV, ex-8RY, is eager to QSO the old Ohio gang and promises a card with big red call letters for each QSO. NDN has a new beam fired up on 14 Mc. AYS is looking for 14- and 3.5-Mc. traffic. AQ had a portable rig with an 807 in the final with him on his vacation, which was spent in Maine. LCY has his newly-overhauled rig all fired up and ready for traffic. DAE has 500 watts on 14 Mc. working into a doublet made from Amphenol 300-ohm line. EQN, 4TFK, 9QLF, 9NDY, 8PUN, 8DZO, 8TRX, 8STZ, 8LOF, 8THJ, 8TYX, and their families, had a wonderful time at the Dog House Net picnic held at Serpent Mound Park in southern Ohio on July 21st. KQE is burning up 144 Mc. with a new rig. RN is spending his spare time between QSOs redecorating his home. WE, while waiting for his new receiver, is spending his time helping to reorganize the Findlay Radio Club. 9YAH/8 is busy fixing up his new home in Celina. The Greater Cincinnati Amateur Radio Association is engaging in an enormous amount of activity that is without precedent for Cincy. Picnics, stag hamfests, contests, code classes, raffles, and well-attended meetings are the order of the day. JKW and QHZ now are working in double harness. Congratulations, fellows. VVL, the new net control station of the Queen City Emergency Net, is ready for action on all low-frequency bands and is to be dedicated to the memory of Dudley Outcault, a prominent Cincinnati judge

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and well-known ham, who was a World War I casualty. TAJ reports great activity by the Intercity Radio Club, which represents the hams in the counties of Richland, Ashland, Knox, Morrow, Crawford, and Huron. Each meeting is held in a different town and the club organ, "*Drips from the Grid Pan*," is mailed to an exclusively-ham membership, which is also entirely ARRL. Traffic: W8EQN 37, AQ 16, RN 14, WE 9, DAE 1. 73, and so long. *Carl.*

WISCONSIN — Acting SCM, C. C. Richelieu, W9ARE — W9USA, operated by MRAC at Milwaukee Centurama, handled record amounts of traffic on all bands and proved most popular exhibit at the exposition, which ended Aug. 12th. MUM, DIR, SZL, IQW, and IGC renewed ORS/OPS certificates. DRN worked Milwaukee from Twin Lakes on 144 Mc. after changing to vertical antenna. CIH, with elaborate frequency-measuring equipment, is new OO. PEC is new Section EC for Wisconsin and will be contacting all stations interested in emergency work. PFH is new OBS. RQM worked 293 stations in Field Day using 400-ft. sky wire 100 feet high. IGC is active and reports HBF, a blind ham, active on 3.5 and 7 Mc. LFK has new v.f.o. This section news can only be as interesting as your reports to me make it. Send them in by the 1st to 4901 S. 30th St., Milwaukee 14. Traffic: W9ARE 81, RQM 20, LFK 4. 73. *Rich.*

DAKOTA DIVISION

NORTH DAKOTA — SCM, Raymond V. Barnett, WØEVP — JVP and LUP have received their discharges from the armed forces. KET, of Minneapolis, Minn., is moving to Jamestown, N. Dak., where he will be on the Northwest Airlines staff. KZL is helping EVP build his new house. GJJ has acquired a National 101X receiver and has a new center-fed antenna hoisted. FSA is a new call at Grand Forks. OCI is radio operator for Department of Justice Border Patrol. RGT has installed fan "blowers" to cool his HK254s. VAZ has most of the parts accumulated for a full kw. rig. DM was leader at a summer scout camp. 73. *Ray.*

SOUTH DAKOTA — SCM, P. H. Schultz, WØQVY — WUU sold his Howard 430 and now has a new RME-45. FJR got his SX-25. ADJ has a new HQ-129-X. BLK got an SX-28A in place of an SX-25. JLS, new ham at Rapid, is secretary of the club and sends copy of BHARC minutes after each meeting to SCM. OQQ reports that he is new president of Bear Butte Amateur Radio Club. Members are from Lead, Tilford and Sturgis. A contest was held with Rapid on Field Day. (He says the Bear Butte operators won.) Didn't see any reference to it in minutes of BHARC meeting. KEE, FKX, RWX, KTS, YTE, AGL, MRP, YYJ, OQG, and OQQ are a few of the Bear Butte members, with RWX, vice-pres., and KEE, secy-treas. EC and other appointments are open in all sections of the State. Why not make application? ADJ and KTS have been suggested from Rapid and Sturgis Clubs. How about some suggestions from central and eastern South Dakota? 73. *Phil.*

SOUTHERN MINNESOTA — SCM, Vernon G. Pribyl, W9ØMC — JNC reports he had a good time in the ORS Party in spite of the fact that his transmitter went bad and he had to finish up with 25 watts to a "V" beam. VKF now is in Peoria, Ill. RJF blew his big power transformer but it took two days of experimenting before he was convinced. He now is on with 70 watts using his exciter. He tried ORS Party but decided a v.f.o. is the only thing for contests. OMC enjoyed a nice week's vacation and is now working on a new exciter. DRG stopped in to see the SCM while on vacation. Traffic: WØJNC 7.

DELTA DIVISION

ARKANSAS — SCM, Marshall Riggs, W5JIC — QI is sure going to town on 14-Mc. 'phone with fifteen countries in fifteen days. KVW is winding plate transformer. HEW is doing OK with low power on 3.9-Mc. 'phone. JSR has left us for San Francisco and the fair State of California. CPV is building new rig at Camden. HPL finally broke the ice and got a pea squirter on 3.5-Mc. c.w. CTS has gotten all the bugs out and is working on 7 Mc. GWT is back with us before going on another job. HDR was a visitor in town recently and is making every effort to get 600 watts on soon. 9WXE and 9ZAW were visitors of JIC and are going to spend vacation in the Ozarks. IVY is in paradise with 7 Mc. back. IWL has new portable emergency rig which works in nice shape. JIC is just finishing up new rack and panel

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job all-band affair with p.p. 35TG in final. JPY is on 3.9-Mc. 'phone with his HT-4 rig and wants somebody to talk to. Let me hear from you, boys, on what is happening in your neck of the woods. 73. *Marshall.*

LOUISIANA — SCM, W. J. Wilkinson, jr., W5DWW — RM: KTE. PAM: CEW. JPJ is looking for hams to take part in Civil Air Patrol in major Louisiana cities. KUG and KTE want traffic schedules. EGK is putting 400 watts on 14 Mc. CNG has 850 watts on 3.9-Mc. 'phone. JEY has new mobile rig on 28 Mc. IDK has revamped for 28 Mc. AKJ is keeping 28-Mc. schedules. KUZ and JET are on 7 Mc. HCV got a Class A ticket. Officers of Ouachita Valley Amateur Radio Club are: HEJ, pres.; HOS, vice-pres.; JET, treas.; FJW, secy.; IVF, publicity. LDL is putting 14-Mc. rotary on roof top. KUM wants rag-chewers on 7 Mc. FJO, QH, ABA, HAH, IHR, and KMD are active. LJT and LMN are new hams. HHV is busy with EC work. FDC has new 100-watt rig. BSR is on 3.9-Mc. 'phone. LAE worked three VKs and two ZLs in an hour on 28-Mc. 'phone. Correction: The Delta Radio Club meets every second Thursday. IHN worked Persia, Java, Japan, and Surinam on 14-Mc. 'phone. QJ is back on 28 Mc. IXL worked CX4CS with only 4½ watts input. KXP has worked all districts with 50 watts. KTB has new four-element beam. GJO has an HT-9 running 125 watts on 'phone bands. 29-Mc. boys are LAE, KXP, KXU, HTU, KOQ, and LDH. KKK is on 28 Mc. AEN worked 9SMA, on Christmas Island. KMN is on 7-Mc. c.w. KEK is working mobile. ILB worked his first Central American, YN1RA. LET works forty-mile DX to Shreveport. KTE is organizing traffic net for Louisiana. The SCM wants applicants for ORS, OPS, OES, and EC appointment. CEW, our PAM, is lining up 'phone net. Traffic: W5KUG 4; DWW 5.

TENNESSEE — SCM, James B. Witt, W4SP — MP, ex-GLP, sends in the following: EVX worked VE2 and 1st 2nd, 3rd, 5th, 6th, and 7th districts on 14-Mc. 'phone with 25 watts. ERJ has a kw. on 3.9 and 14-Mc. 'phone. ILZ has 250 watts on 7-, 14-, and 28-Mc. c.w. MP has a new BC-610E transmitter on 14-Mc. 'phone and an SX-25 receiver; also a TR4A on 145 Mc. EAI is on the air again on 7 and 14 Mc. 'phone with pair of 813s p.p.

HUDSON DIVISION

EASTERN NEW YORK — SCM, Ernest E. George, W2HZL — IXK reports NOF and LDS are on 144 Mc. in the Poughkeepsie area with CGT expected on soon. Monthly report from NJF for Westchester area is packed with the following dope: 8LO/2 with two twin-three beams to match 300-ohm Twin-Lead, one E-W and one N-S, WAC'ed in eight hours from Harmonic Hollow. 9PEI/2, Skunk Ridge, has the only 28-Mc. vertical in Westchester. AN works 7ITH regularly. DRH rebuilt and now has three-element gutter pipe on 28 Mc. driven by a tiny motor the size of a hand. ISG is coming back into hamdom and has been appointed chairman of WARA Hamfest. AKJ is driving a pair of 813s into a selsyn-controlled beam. DOM is moving to Long Island. AD is back on in Scarsdale with 60 watts until kw. is ready. 1LAS/2 now is in Maine. JFA, now out of the Navy, is looking for a place to live. NJF has a new center-fed antenna, three half waves on 14 Mc. fed with RG22/U. PNO, PME, and QDM are new hams. AQK is filling the air with Spanish. CNS devised an automatic tuner for his MRT-4 on 144 Mc. He tunes the band every two minutes while he sits back and waits for something to happen. The WARA is offering a prize to members for the best portable rig. The SARA is vacationing during July and August. A few Schenectady hams are getting out on 3.9 and 14 Mc. KLM got his first G card. (HZL worked the rig for him. Hi.)

NEW YORK CITY-LONG ISLAND — SCM, Charles Ham, jr., W2KDC — BGO, Section EC, reports a general summer let-down although the activity on the bands doesn't reflect this. OHE, Brooklyn EC, now is on the mend but has carried on nevertheless. Press has about fifteen stations reporting each drill night. BVP rounds out seventeen years as chief radioman at Floyd Bennett Field. PFA also is there. JSJ operates sporadically due to B.C.I. NXT has overcome the same problem by going to f.m. QNH is latest addition to EC net. DUS is plugging away at beam antenna research. OHE finally neutralized his 829. NKO runs 250 watts on 144 Mc. and does well. LG joined the 3.5-Mc. EC gang who can be heard on 3530 kc. Sunday at 3 P.M. In Suffolk DOG continues associations with Red

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Cross; he's looking for stations on Shelter Island. KNA handles the job in Babylon. FCH leads the North Fork Chapter and Monday night always shows a good turnout on 144 Mc. HQB is lining up the Huntington gang. JWO gets out very well from Patchogue, where he is net control. DOG is adding 24Gs to final. (That is some acceleration!) ADW has improved his signal with an 829. FCH has new antenna location and EBT has a four-element beam. OQI complains of business interfering with hamming, but one must work to ham. Queens County reports via the new EC, BSP, who is sponsoring a new member contest which is going strong. BKZ was forced to QRT because of house hunting. Bill sends in an imposing list of twenty-two regulars and promises more. The Staten Island gang is becoming more active and OFD, the EC, promises more and better activity and is appointing GHK assistant EC. Stu reports ADJ has moved to Rochester, JIX to Red Bank, and HIY temporarily to California. MQS is new call. OBN is on 3.5-Mc. 'phone. All Staten Island hams interested in the postwar SIARA should contact GHK at DO6-1483M. KJY is moving to Franklin Square. He has some fine new gear and hopes to work 7 and 14-Mc. c.w. JJY still is under construction, as is KD. NAZ had big time in ORS Party working forty-seven stations in twenty-seven sections. She also received her 35-w.p.m. sticker and says her ambition is to work all U. S. counties. Ex-NIL, formerly of College Point, now is 6VOQ and on 3552-kc. c.w. from 2100-2300 PST and would like to renew old Eastern contacts. JAU is on 3.5-, 7-, and 14-Mc. c.w. IXZ is using 8 watts to 25L6s from 110 d.c. line. Dan is looking for an SW-3 and awaits the NYC-LI net on 3710.2 kc. KIK, now at Ft. Dix, is going to Japan and hopes to schedule KOK on 28 Mc. if Tom can stop the fuses blowing. Don't say Selenium to OG. QUT is new call in Jackson Heights; Andy uses a 316A on 144 Mc. OBU acted as relay between 8RZK/3 and 3KIT for three hours. George also is taking north-south traffic with 1IIN/3 at Baltimore and is seeking New England contacts. LGK is on 144 Mc.; IUD is on 28-Mc. c.w. with 400 watts. FRD is building 144-Mc. mobile. MYR, in the Catskills, is working FB. IAG is back to reporting fire signals as in WERS days. JYR is busy on several bands including 144 Mc. OLM, using 25 watts on 7 Mc., worked four countries. FJU is recovering from Field Day. BO schedules EL4A and 9USA and is on for daily traffic. HPB is at South Charleston and expects to be discharged in September. GUR has been out since March and is manufacturer's representative now. LGK joined Tu-Boro and is struggling with 2A3 on 144 Mc. AYJ is building 75 watts mobile. HXT is busy with 14-Mc. Q antenna and worked his first Ø, who turned out to be an old buddy at Sioux Falls, S. D. PMA reports many new YLRL members, including QVM on 7-Mc. c.w., QJC, PBI, and RAQ. Traffic: W2BO 38, OLM 10, DOG 4, KDC 3, OBU 3, JAU 2.

MIDWEST DIVISION

IOWA — SCM, Leslie B. Vennard, W9PJR — ØKZI, of the 75 'phone net, renewed his EC appointment and says there are only four hams in Ottumwa now. GKS has renewed his ORS appointment and says "BPL, here I come." TGK has renewed ORS appointment, but has been very busy on his job. VFM joined the ranks of the OES and wants 144-Mc. contacts. GLR reports from Mason City that their club meets the first Monday in the month. We attended the EFI-NXW picnic at Manilla and a fine time was had by all. CVU thinks someone should use the big club to some of the hams around here — too many rotten signals. ØCCE is getting his Emergency Corps gang lined up. ØMFX was called an old ham in error. He is sixteen years old and would like contacts with other high school boys. YDX reports a new jr. operator. TIO reports a Central Iowa picnic will be held at Log Cabin City Park, Slater, Iowa, Sept. 29th. NTI will demonstrate Collins transmitter and receiver. There will be free coffee and no admission cost, but some prizes. AHP is very active on Iowa 75 net. TMY still is waiting for his Class A ticket. Let's have more EC nominations, fellows. We are only half ready for that communication failure here in Iowa. Traffic: W9YBV 34, 9EFI 8, ØQVA 4, 9AHP 2. 73. *Les.*

KANSAS — SCM, A. B. Unruh, WØAWP — PAH and family are vacationing in Colorado. YUQ is working into Kansas City from Manhattan almost every night, on 50 Mc. He uses two three-element beams, stacked. UWN and his YF purchased new home, and are making their annual

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Minnesota trek again this August. Quote. Will fish, loaf, and look for those tall masts. Unquote. 9OWZ/7 visited in Kansas. He is in Wyoming now. TVU was Wichita, Salina, and Hutchinson visitor. EPX is ex-AJD and 5KSF, and has 220 watts on 3.5- and 7-Mc. emergency rig. He asks for EC and ORS application blanks. Occupation: Commercial operator for Braniff at Kansas City. A demonstration of 144-Mc. walkie-talkie to fixed station was given at August Wichita Club meeting and local radio supply houses now report brisk demand for 144-Mc. components. Two more KGPZ operators are making application for ham calls. This will bring the total to six. Plans are being made to attend Midwest Division Convention in Topeka October 5–6. The Eager-Beaver 50-Mc. Net held a hamfest in Manhattan August 4th, meeting at QTH of YUQ. Members of the net include ZJB, YUQ, ICV, and VWU. See you in Topeka Oct. 5–6. *Abie.*

MISSOURI — SCM, Mrs. Letha A. Dangerfield, WØOUD — ARH has a new four-element beam on 28 Mc., made five DX contacts, and delivered a message from KZ6AB to St. Jo. ZKY has a new speech amplifier but no driver for modulators so far. IDN is cussing 3.5-Mc. QTN. HQI is grinding crystals. SNM got his old call back. TDH has an 807 on 3.5-Mc. c.w. with 813 in prospect. VYO has a new HRO and is building push-pull TZ40s for 14-Mc. c.w. ZVS has an 807 on 3.5 Mc. and 6L6 on 7 Mc. OFB, now in Oklahoma City, is on 7 Mc. from 7 to 8:30 A.M. and 9 P.M. to 9 A.M. with an 807 and would like Kansas City QSOs, schedules, and traffic. GBJ, on 14 Mc. with 300 watts, took traffic from D4ADN, a local ham now in Berlin. ZJB reports the Eager Beaver v.h.f. 50-Mc. net had a Field Day at Manhattan, Kans., on Aug. 4th. ZIS, in St. Louis, is the second Missouri OES. YHZ received OO appointment; he works into New York and Pennsylvania with 12 watts on 28 Mc., but does not have much luck on 3.9 Mc. PPD/Ø, back from Tinian, is building rig for 14 and 28 Mc. and needs receiver. GCL works 3.5 Mc. when not on the road for CAA. HUZ is QRL getting cobwebs and muddaubers out of the old rig, which he will use on 3.5 Mc. while building new one for 3.9 and 14 Mc. for a whirl at 'phone. EYM has accepted appointment as PAM and can arrange schedules after 11 P.M., and is on 3.9 Mc. KIK has 30 watts on 3.5-Mc. c.w. and wants dope on nets and traffic. IMZ is program manager for the new CBS station, KSWM, in Joplin, but has a little time for 3.9-Mc. 'phone. OUD is using an 812 on 7 Mc. but finds QRM too heavy. If you like to read it — send it in. Thanks, gang. Traffic: WØARH 3, WØGBJ 2.

NEBRASKA — SCM, Arthur R. Gaeth, sr., WØFQB — TQD reports JEE, of Hebron, a Silent Key. DMY is all set with an all-band antenna. BAF, of St. Louis, dropped in to see Lyle while on the way to Estes Park and saw the e.c.o. which helped raise ZS1BM. EWO reports observation of atomic effects nil, because of local h.f. QRM, trying to stir up interest on 144 Mc., and using 7193 oscillator and 829B amplifier, modulated by pair of 6L6s. Ex-DFF is signing 5JPJ and lives at 3696 Louisiana Ave., Parkway, New Orleans 15, La. OKF bought some butterfly condensers from Army surplus and will try out some u.h.f. oscillator circuits and work out a continuously variable test oscillator. RGK, not RQK as previously reported, is vice-president of the Western Nebraska Radio Amateurs. RQK reports as follows: EXP put up two 65-ft. masts and won two 807s at a hamfest held at TMK's. TMK is on 28 Mc. with a commercial-looking home-built rig with an 812 final. KNW has telephone pole on which to build mast. GPX has 6L6 Tri-tet and 807 final on 28 Mc. OHU has semi-e.c.o., 12 crystals, all switched. BIW is looking for 14-Mc. DX with paralleled 807s. RQK has three half-waves on 14 Mc. and telephone pole on which to build beam. He worked 6TSW, ex-9ZNA. Ex-LTL reports ex-LPA now 6VKC, not UKC as previously reported. Pfc. LIQ, Ft. Monmouth, wants to schedule someone in Omaha on 3.5 Mc. The Ak-Sar-Ben Radio Club held an FB hamfest at Linoma Beach on August 25th. Let's have your inquiry regarding appointments. *Art.*

NEW ENGLAND DIVISION

MAINE — SCM, G. C. Brown, W1AQL — Those who were unable to attend the Hamfest and Field Day at Trenton on July 28th sure missed an FB time. We take off our hats to DPJ for the swell job he did as chairman of the committee. Much credit also goes to Mrs. CBV for her help in typing and mailing out the notices. HIE was on the beam

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in handling the sports. The c.w. boys won the ball game. The Club is very grateful to AUC and ex-BYI for obtaining and arranging the grounds. 2HNP was winner of the field prize. JSY took the prize for having traveled the longest distance. GKT reports the following visitors: MSJ, MGP, 4GPW, 2OKN, APX, VE2RD, and VE2WC. ERZ says that BEZ is using a Tri-tet on 3.5, 7, and 14 Mc., and also that the Lewiston-Auburn Ham Club meets every Tuesday evening in Auburn City Hall. OEN is a new-comer located in Pittsfield. MUY is back on the air. MLP is lobster fishing and DXing on 3.5 Mc. KYT is attending U.C.L.A. NXX is using a German receiver. IIA is radio manager at Sears and Roebuck. EZR visited MLP and met IIE and LUK. 2UL called on EZR. MGP is located in Saugus, Mass., and spent his vacation in Maine. During his trip he called on AWZ, LKP, GKJ, FBJ, MVD, AUC, DHD, ATS, KNJ, MPK, JJN, and many more. BGU is living in Boston. KVK is back at WABI. MIR is pounding brass at WBF. DEG is in Newton Highlands, Mass. MEV is located in Winthrop, Mass. BFA is with the CAA at Augusta. Traffic: W1EZR 2. 73. "*G.C.*"

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — The BOSTON HAMFEST, sponsored by the South Shore Amateur Radio Club and the Eastern Mass. Amateur Radio Assn., will be held on Oct. 19th at the Mechanics Building, 135 Huntington Ave., Boston. ALP has charge of the tickets and we expect to have them available at all ham radio stores in Boston. GYZ is chairman; HLX, vice-chairman; OLP, secy. New ECs: LMS, Stoneham; WS, Natick; JUL, Framingham; LJT, Brockton; 8BHY/1, Dover. New OES: ILS, WS, LJT, and LNX. New ORS: NXY and LLX. EMG renewed his ORS and RP his OPS and OBS appointments. The Watson Lab Amateur Radio Assn. in Cambridge received the call ORT and will have rigs on all bands. The club holds OBS appointment. Guy Migliore has call ONZ and is on 144 Mc. We heard MKN/2, in Syracuse, on 3.9-Mc. 'phone. 6RQI is on 28 Mc. OOQ is on 144 and 28 Mc. OJM is ex-5HQN. 9FO has new call, ONV. Harold J. A. Street, of Dedham, is OMR. OGK, OEF, and 9JSU are on 144 Mc. OLC is on 28 Mc. KIM is on 144 Mc. and had 9TKW and 9NZM at his shack. OOK is on 14 Mc. PX is on 3.5-Mc. c.w. in Falmouth. 2VH, in Dennis, is on 144 Mc. and has been working the gang around Boston. BUG is on with a new rig on 3.9-Mc. 'phone. ALP has a rig on 144 Mc. and a receiver like Ed Tilton's in Feb. *QST*. Phil Labombarde, a member of M.I.T. Radio Society, has call OMZ and will be on 28 Mc. 7GIL, the secy., reports that MX will be on 14-Mc. c.w. with 1-kw. rig and will have separate rigs on all bands. JSM, LNX, and ILS are on 2400 Mc. and established a new record. 2NAB gave a talk at the El Ray Amateur Radio Club, OMI. Get ready, gang, for the Sweepstakes. BDU has a weekly schedule with BVR in Westfield. Dick Harvey, ex-4IHA, has call OSX. HDJ sent in his OPS certificate for endorsement. HWE is on 28 Mc. but will be on 3.5-Mc. c.w. later. LXQ is on 3.5 and 14 Mc. IPK, secretary of the T9 Radio Club, reports the last meeting was held at BVL's. LLX was in the ORS/OPS Party; he has a 700-watter on 3.5 and 7 Mc. NXY has a schedule with GZ/3 in Washington, D. C. and 2LRP in New York City, and is building a pipe receiver for 144 Mc. LQQ worked VS9AN and would like his QTH. MCC has new 300-watt rig. OMM has new HT-4 and is waiting for Super-Pro. BDU wants a game of chess by radio. CTW is working on 230-Mc. crystal job. PI is back on 144 Mc. IID, NXO, and IKW are in Hull for the summer and on 144 Mc. IID is working on 50-Mc. t.r.f. converter. AWA says his beam is working swell on 144 Mc. WK has a beam on 28 and 14 Mc. on the same frame. EMG has an RK4D32 on the air and is going to join an Air Wing of the National Guard. KUJ has a rig ready to go on the air. LJH has 28-meter job in his car. HXK and NBV visited site of old WCC at Wellfleet. OKB is on 3.5-Mc c.w. OID is new ham in Malden on 144 Mc. MGP is on 144-Mc. mobile, also LVV. HZ and OSX are building a 14-Mc. beam for ORT. JWU is living in Texas. MIH would like to see an amateur radio club started down Hyannis way. 3HCE/1 is active on 144 Mc.; MRU is back on. Traffic: W1NXY 20, BDU 10, LQQ 4, OJM 3, LLX 3, EMG 2.

WESTERN MASSACHUSETTS — SCM, William J. Barrett, W1JAH — KFV ran country total up to forty-six, including WAC on 14 Mc. in a week. Bob's DX included YI5AL, YR5X, UA0KAA, and ZD8A. Bob also got his old

(*Continued on page 82*)

(Continued from page 80)

call back — a relief after signing KF6SJJ/W1 for so long. MVV is out of the Navy and is struggling with a pair of 812s. Clayt is anxious to get in touch with HQZ. GJJ is swimming instructor at YMCA camp. NKN is looking for a sunspot eliminator. EOB is dreaming up a new receiver with triple detection. BVR took a fling at 14 Mc. and worked seventeen countries during the month. BIV has modulator nearly ready to go. The Western Massachusetts net is meeting Monday and Thursday at 7 P.M. on 3760 kc. Active so far, under the direction of Route Manager BVR, are EOB, KZS, LTA, FOI, MKR/2, JAH, and BIV. If interested in traffic-handling, drop in on the net any night. If your frequency is a little off, just drop a card to BVR and we will work you in. JAH extended antenna to full wave, with far end only three feet off ground, pending acquisition of a new pole. BSJ is doing nice job lining up emergency communications for the section. It's a slow job, but a vital one. If you have facilities for emergency work on any band, contact BSJ. Traffic: W1KFV 5, FOI 4, JAH 4, NKN 4, BVR 3, EOB 2, LTA 1. 73. *Bill.*

NEW HAMPSHIRE — SCM, John H. Stoughton, W1AXL — Again we remind you of the New Hampshire State Convention which will be held at the Hotel Carpenter at Manchester on Oct. 26th. Tickets are $4.25 per, or $4.00 if purchased before Sept. 30th. Get your tickets early and be sure of a seat. ORN, of Whitefield, has received his new call but reports that he won't be active until early next year. He still is on active duty with the Army as an instructor and is stationed at Fort Monmouth, N. J. A few of the gang had an outing in the White Mountains recently. Among the group were 2NSD, 2NYC, 2LEP, 1MCS, 1LUD, 1NMM, and 1LTS. They had two mobile rigs and two walkie-talkies and report 144-Mc. reception good on the summit of Mt. Washington. FZ has a new five-element 146-Mc. beam. AUY and LYS have new RME-45 receivers. AVJ will be back on the air soon from Canterbury with his new HRO and a pair of 4-125As in the final. APK is our new Section Emergency Coördinator. All of you who are interested in emergency work, please contact Basil for AEC membership. 30. #4.

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC — QR put up new antenna with no better reports. He finally has his 3642-kc. crystal for Nutmeg Net. DWO vacationed in Maine for ten days, acquired a 1N21 crystal absorption-type meter, made some 14-Mc. QSOs with England, France, Cuba, and Netherlands, and expects to move to Massachusetts soon. AQ submits a combined report showing twenty members and a code class running on Thursdays. CPV is on 144-Mc. 'phone and 3.5-Mc. c.w. AOP has a 50-Mc. receiver. NMV is working fixed portable on 144 Mc. and is chief radioman, USN. KWA and IMY are mobile on 144 Mc. AKA has an all-band transmitter partly finished. AWE is on 3.5 Mc. HCW is on 144, 14, and 7 Mc. BGA is active on all bands. JMT is on 144 Mc. EJ is active on 144, 7, and 3.5 Mc. MNC is mobile on 144 Mc. and claims new title — HEWN, heard everybody, works nobody. CH pays AQ a visit now and then. HRC rebuilt the exciter for band-switching and then interrupted the program to do the annual mountain climbing. Got a Sky Ranger and took it to Vermont and was really surprised at some of the short-wave reception in valley towns like Manchester. Stopped at BVR's for a short visit and now we know what he means when he says "power-leak." Traffic: W1QR 3.

VERMONT — SCM, Gerald W. Benedict, W1NDL — 4DZV/1, located at Bomoseen, has Signal Shifter on 14, 7, and 3.5 Mc. 9WSF/1, the Reverend H. E. Allen, is located in Brattleboro, and has 7 watts to 6V6 on 3.5 Mc. MEP now is in Bennington and has rigs on 144, 50, and 28 Mc. KNC, in North Bennington, has rigs on 144 and 28 Mc. FPS is on 3.5 Mc. in Brattleboro. IQG is located at Orleans. IQG built an HRO from parts. MCQ and KJG spent Field Day at Lake Elmore. KJG is building new shack. MCQ has new RME-45. NDB has new taxi business. NDL visited MCQ. OQB is new ham in Barre, and will be on 3.9 Mc. with 30 watts. NLO spent a day in Montpelier with NDL. Traffic: W1AVP 11, NDL 3. 73. *Jerry.*

NORTHWESTERN DIVISION

ALASKA — SCM, August G. Hiebert, K7CBF — Another Alaskan amateur club has been revived at Juneau. There are fifteen members, with ENA, pres.; AE, vice-pres.; and FBN, secy-treas. Meetings are held once a month at

(Continued on page 84)


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Selector Switches
Bulletin 722

(*Continued from page 82*)

members' homes. AB and BN are on 3.5-Mc. c.w. with 807s while GIN is getting along with flea power. BA works 3.9-Mc. 'phone. AF works 3.5 and 14 Mc. with a Signal Shifter and an 813 final, while AE dims the lights in Juneau with half a kilowatt on all bands. AR warms up on 3.5-Mc. now and then. While awaiting the arrival of a BC-610 from the States, 9TOM KL7, at Annex Creek, is using low power on 3.5-Mc. 'phone and c.w. AQ is heading Stateside. Cape Nome's only representative, GBF, has been getting good results from his 5-wave rhombic. AFG, Alaska's high man in Band Warning Contest, celebrated by visiting Fairbanks. CF, newest licensed operator in Fairbanks, is burning up 3.5 Mc. with flea power. *Augie.*

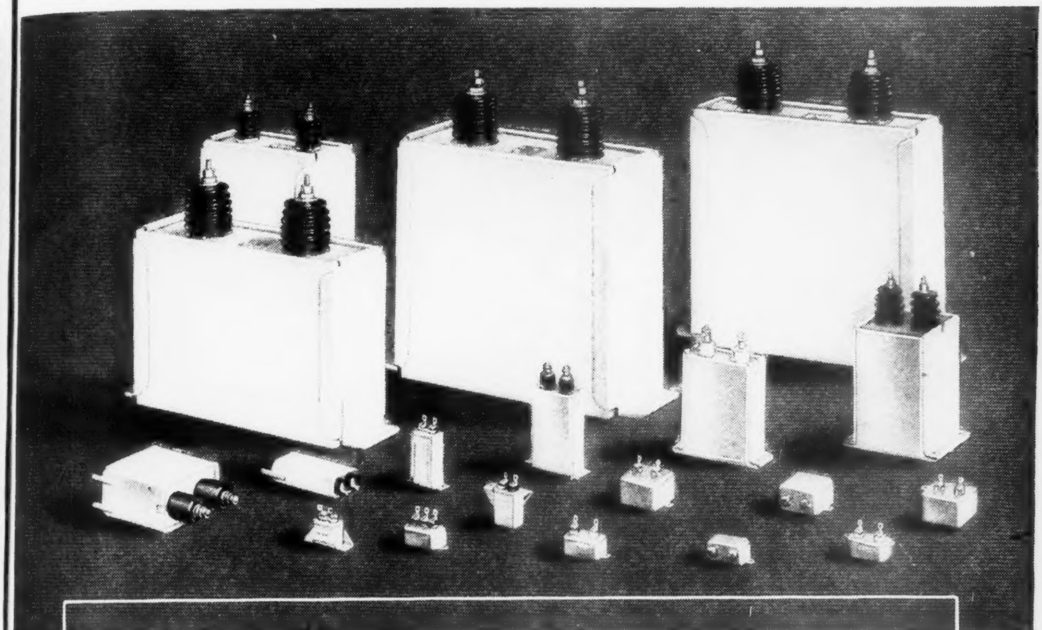
MONTANA — SCM, Albert Beck, W7EQM — Section EC: BWH. Our heartfelt sympathy to CPY and CBY on the death of Mrs. Rex Roberts. Best wishes to CPY for a speedy recovery from serious injuries received in the same car accident. Hamfest history was made at Two Medicine Lake, Glacier Park, July 20th and 21st, when VEs and Ws organized the Waterton-Glacier International Hamfest. Officers elected were FL, pres.; BOZ, vice-pres.; VE6SR, secy. About fifty hams registered this year. IRP, newly arrived from Helena, while listening heard JFR on 28 Mc. JFR gave his QTH and IRP was surprised to find out that he was living upstairs over JFR. BWH is proud of new transmitter. DXQ, teeth chattering, was heard working his portable rig from camp site near Livingston. FL worked J3, KA, and VS1 with single RK20A on 14 Mc. CJN and EMF are experimenting with new tubes on 144 Mc. How about some reports, gang? Get them in by the first of the month. 73. *Al.*

OREGON — Acting SCM, Cliff Tice, W7BEE — Bend reports the new three-element rotary beam for 28 Mc. used by HHH is working fine. Others active are JHF with a forty-watt rig, and JIB on 3.9-Mc. c.w. Don Peters, who has received his operator's license but not the station call, has a new SX-25 receiver and has a 150-watt rig nearly finished. A late report from Medford gives the results of their Field Day. They assembled on Roxy Ann Mountain, about three miles east of Medford. Those with rigs were HLF, FUN, DBZ, FSP, FRO, and HWH, while FMQ, FRL, AZZ, and GUP did the heavy looking on. Best DX was by FRO, who worked Enid, Okla. Second best was by FSP. The gang was rained out the second day. Lots of fun and plenty of work was had by all. FUN will erect a tent the next time just in case it rains. Most of the activity of the Pendleton bunch has centered around MQ's new transmitter. Quite a few Europeans have been contacted on 14 Mc., mostly on c.w. One of our more active members is due to go to work for Uncle Sam on the first of September; EQI, manager of the local broadcasting station, is due for induction into the Army. Little, except listening, for BEE. I have noticed, however, that the ZLs are coming in with a good signal strength in the afternoons. The PARC soon will have about ten members on a spot frequency for local contacts on c.w. All will be on low power so as to cause as little QRM as possible, but it will help to keep up the practice on c.w., which is slightly neglected while on 'phone. 73. *Cliff.*

WASHINGTON — SCM, O. U. Tatro, W7FWD — Everett: MH, ex-GUU, has been endorsed as ORS. He is on 28 and 3.5 Mc. when not at KRKO. CZY is the first to apply for OES blanks. He holds daily schedule with DYD on 144 Mc. CSK is on 14 Mc.; JFB, 3.5, 14, 28, and 144 Mc.; DYD, 3.5, 28, 50, and 144 Mc.; CHZ, 14 and 28 Mc.; CEC, 28 and 50 Mc.; JIQ 28 Mc.; BTN, 28 Mc.; IXT, 28 Mc.; BWC, 3.5 Mc.; DQX, 28 Mc.; GHZ, 28 Mc. JIQ is portable-mobile on 28 Mc. and IOQ is portable-mobile on 28 and 144 Mc. Olympia: ORC is on summer schedule with meetings on the fourth Thursday, but regular schedule of second Tuesday and fourth Thursday will begin in October. CBS and QB, of Spokane, were recent visitors and had to hold their hamming in abeyance until they completed a government installation at McChord Field. JFD and family suspended 3.5-Mc. activity for a vacation and dropped in on us en route. HPU did likewise. He is on 3.5 and 14 Mc. EFI and CQJ hold nightly schedule on 28 Mc. between Olympia and Centralia. HML sent FWR a "First Day Cover" from Bikini on the day of the first bomb test. A dead 28-Mc. band defeated her attempt to contact her son on Saipan. GP stopped construction on the new transmitter to paint his house. Pullman: ITR is on 7 and 3.5 Mc. and reports FIR building a kw. and GND on 3.5 and 7 Mc. with a Stancor P10. Seattle: CWN was in the ORS Party. JEA

(*Continued on page 88*)

HERE'S A *New Line* OF D-C CAPACITORS



BETTER IN *"Civvies"* FOR HAVING WON THEIR SERVICE STRIPES

It's an open secret among the trade that G-E Pyranol capacitors, which enjoyed such an enviable reputation before the war, are now better than ever.

The reason for this is obvious. Some pretty tough demands had to be satisfied during the war. The strict quality control methods, new manufacturing techniques, and improved materials, instituted at that time have produced outstanding results which General Electric has now incorporated in a new line of Pyranol capacitors designed to meet commercial requirements.

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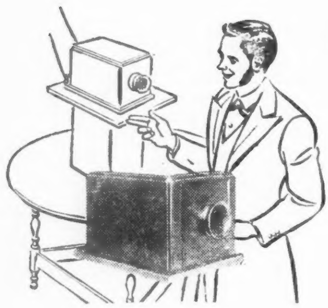
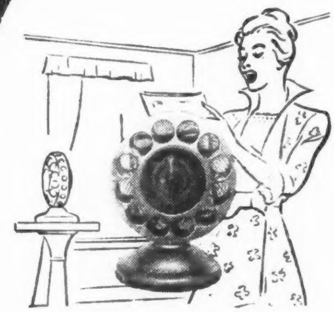
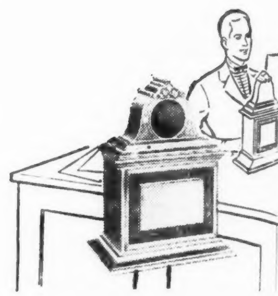


1877: Grand-daddy of all microphones was Alexander Graham Bell's box telephone, into which Thomas A. Watson shouted and sang in the first intercity demonstrations of the infant art of telephony.



1920: Telephone scientists developed the first successful commercial mike — the double carbon button air-damped type. Used first in public address systems, it later became the early symbol of broadcasting.



1921: The condenser microphone, de-signed by Bell Laboratories for sounc measurement in 1916, entered the public address and broadcasting fields. It provided a wide frequency range and reduced distortion.

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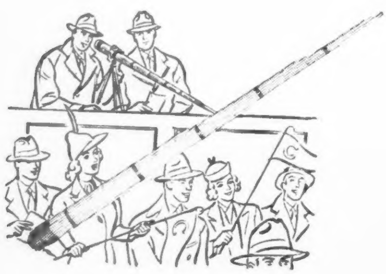
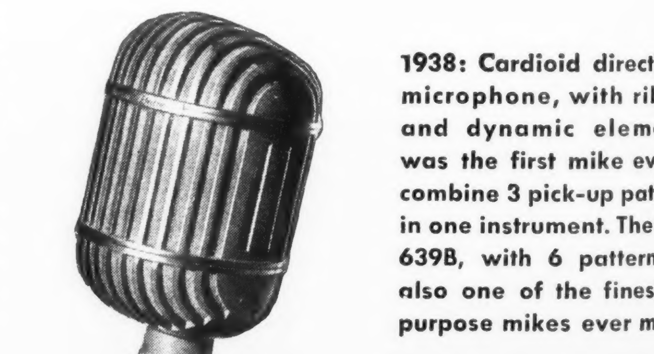


1937: The Western Electric "Machine Gun" mike does for sound pick-up what the telephoto lens does for photography. Sharply directional, this microphone makes sound "close-ups" at unusually long range.

1938: Cardioid directional microphone, with ribbon and dynamic elements, was the first mike ever to combine 3 pick-up patterns in one instrument. The later 639B, with 6 patterns, is also one of the finest all-purpose mikes ever made.



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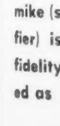
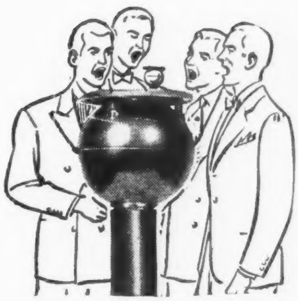


pace in Microphone Development

1931: Bell Telephone Laboratories developed the Western Electric moving coil or dynamic microphone. The first of its kind, it was rugged, noiseless, compact, and needed no polarizing energy. Many are still in use.



1935: The first non-directional mike—the famous Western Electric 8-Ball, designed by Bell Laboratories. Small, spherical, it provided top quality single mike pick-up of speech or music from every direction.

1936: Directional with slide-on baffle, non-directional without it, the Salt Shaker gave highest quality pick-up at low cost. Widely used in studios and remotes as well as in high quality sound distribution.

1946: No larger in diameter than a quarter, the 640 Double-A condenser mike (shown with associated amplifier) is ideal for single mike high fidelity pick-ups. Originally designed as a laboratory test instrument.

What is a microphone? Fundamentally it's a device which converts sound into electrical energy—just what Bell's original telephone did for the first time away back in the seventies.

Today's Western Electric mikes—the Salt Shaker, Cardioid and 640 Double-A—are a far cry from the first crude, close-talking telephone transmitter. But they're its direct descendants.

Year after year, Bell Telephone scientists — through continuing research — have developed finer and finer telephones and microphones. Year after year, Western Electric has manufactured these instruments, building quality into each one.

Together these teammates have been responsible for almost every important advance in microphone development.

Whether you want a single mike, a complete broadcasting station, or radio telephone equipment for use on land, at sea or in the air, here's the point to remember:

If Bell Telephone Laboratories designed it and Western Electric made it, you can be sure there's nothing finer.

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(*Continued from page 84*)

has been assigned to sea duty so will not be heard with his OBS duties for sometime. Spokane: EEN, the EC, reports the construction and testing of a few transmitters and receivers for emergency use, also a 500-watt gas-driven generator to supply 110 volts for same. In addition he had a 28-Mc. portable-mobile unit in his car using a converter feeding into the car receiver at 1500 kc. It is designed for all bands on 'phone and c.w. The antenna for all bands below 28 Mc. is an Army type box kite. JNP, SROC secy., reports a club banquet was held June 15th with 135 members present. ARRL Field Day was observed by having a portable-mobile rig located on high ground manned by JIK and EEN and contacts were made with a number of California and Central U. S. stations. Walla Walla: FPP, the EC, reports via 3.5 Mc. (a good way to report; watch for bulletins at 9:15 P.M. and give me a call; I listen over the entire band after a bulletin) that EMP is portable-mobile on 28 Mc. and BEE on same breed of contraption. GUN is on 7 Mc. FDN and EX are on 3.5 Mc. FPP gave Class C exam to four prospects. Woodinville: FRU is on 7 and 14 Mc., and is checking up to make sure he was in right spot. 73. *Tate.*

PACIFIC DIVISION

HAWAII — Acting SCM, John F. Souza, jr., K6PHD — The K6 gang is very slowly rolling into shape because of the acute shortage of equipment on the market. CGK is knocking over DX with a kw. feeding a "V" beam atop 75-footers. LKN raised AC4YN on a CQ and almost had convulsions waking up the neighborhood with the commotion. While on vacation IQN camped on 14 Mc. throughout his waking hours and sneaked in a bit of DX in the process. FAZ has finally tamed his pair of 807s p.p. and is doing nicely on 14-Mc. c.w. but feels that more power would help, consequently a pair of 35Ts is taking shape. QBI is on 14-Mc. c.w. with a push-push pair of 807s. SDM is now found on 7 and 14 Mc. with a single 814 and is looking for South America for WAC. NSD is on 28 Mc. with a vertical half-wave doublet. The Maui Amateur Radio Club is holding classes on theory and code for new members. The Hilo gang has formed a new radio club. 73. *Johnny.*

NEVADA — SCM, N. Arthur Sowle, W7CX — Asst. SCM, Carroll Short, jr., W6BVZ. RM: 7PST. ECs: 6MRT, 7TJY. On July 20th a simulated break occurred in the 287-kv. Boulder Dam Los Angeles power line at a point thirty miles west of the dam in the desert. 6MRT went to the break, set up and established communication on 7 Mc. with 6OPP and 6BVZ in Boulder City. These stations were in direct contact with the power dispatcher at the dam. While in California, MRT, Official Observer, kept daily schedule with OPP and BVZ, Boulder City. IAJ and TYX are on 7 Mc. ONG, TFF, and PGD now have same calls with 7 prefix. 9ZTX/7 will be on in Boulder City with p.p. 807. EJC is on 14 Mc. HB was in our mountains on 3.9-Mc. portable on July 4th. 8ERG/7's first contact was a W8. QAY now is W7. TEI is 7BNX again. UHR is on 3.5- and 7-Mc. c.w. KGR has new SX-25 and operates on 3.5-Mc. c.w. UIZ has 74-foot vertical drain pipe antenna. 73. *Art.*

SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W6BPT — Assistant SCM, Geoffrey Almy, W6TBK — The SCCARA held its monthly dinner meeting at Vahl's Club with an attendance of seventy-five. CEO showed moving pictures of the Eimac plant and the construction of lighthouse tube. NX showed a reel which was taken twenty-five years ago of the amateurs in the Santa Clara Valley at that time. The old-timers got a chance to see themselves as they were many years ago. JTE has resigned as secretary of the Club and 1WV/6 has been appointed to serve for the remainder of the term. Miles has worked a total of forty-seven states and twenty-nine countries from the West Coast. LCF and BPT are tryng to work 14-Mc. DX. JSB can be found on 14 and 7 Mc. with his BC-610. OKQ also is using a BC-610. CFK has a new RME-45. Dick makes his vacation trip to the East by air. LXA has been working 14-Mc. DX on 'phone and keeps schedules with the GIs in Japan. HC is planning a kw. for the near future. TBK is spending time on 140 Mc. and has been heard in Sacramento and Mendocino National Forest. PBV has been elected treasurer of SMCARC at San Mateo. He has worked thirty-seven countries postwar. SYW has worked his first XE contact on 28 Mc. 'phone. UHN was a recent visitor at Ed's shack. FBW enjoying vacation at Carmel. Traffic: W6PBV 12, TBK 3, SYW 1. 73. "*Pinky.*"

EAST BAY — SCM, Horace R. Greer, W6TI — Section

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Section

(*Continued from page 88*)

EC: EE. RM: ZM. EC: QDE. EC u.h.f.: FKQ. Asst. EC u.h.f.: OJU. OO u.h.f.: ZM. OO: ITH. OBS: TT, IDY, ZM, ITH, RMM, and UZX. We were all sorry to hear that ZM is very much under the weather. Sam had a stroke in July and is at the Oak Knoll Hospital. Some of the gang moved his gear out to him so try and work him on 28-Mc. 'phone. Yours truly, TI, is running for director of the Pacific Division. Voting is now under way and all ballots must be in Hartford by October 20th. I would like to have this honored position, having the time that is necessary to do a bang-up job for you, my fellow amateurs. However, gang, let's get those ballots in regardless of who your favorite candidate may be, as the Pacific Division is tops. Let's keep it that way by a 100 per cent vote. BUY, PB and TT are trying to knock off all the good 14-Mc. DX on c.w. QLH's XYL receiver her call, WBK. EJA is active on all bands. DUB is active on 3.9 Mc. 'phone. ELW says 3.9-Mc. 'phone is one of his favorite bands. EY should be active on the air lanes by the time this hits the East Bay. ITH still knocks them off on 14-Mc. 'phone. VOS is moving to the Hawaiian Islands as this goes to press, so the Richmond Radio Club will have to elect a new president. FCF hopes to have a 257B on 3.9 and 3.5 Mc. in the near future and has plans for the organization of a nation-wide ARRL/AVC net on 3.5 Mc. and he says "The American Veteran's Committee is a fast-growing organization and should be looked into by every ham vet of World War II." Interested persons are requested to contact him at present QTH in Oakland. SAN is back at sea after six weeks' vacation. He has increased his power a 35T with 150 watts to a 250th running 600 watts on 3.9-Mc. 'phone and requests the gang to be on the lookout for him on 144-Mc. 'phone mobile on the S. S. *J. L. Hanna* with 15 watts to a one-half antenna, while on the high seas. Let's have that news each month. Traffic: W6ITH 34, EJA 4, TI 3. 73. "*TI.*"

SAN FRANCISCO — SCM, Samuel C. Van Liew, W6CVP — Phone — Juniper 7-6457: Asst. SCM. Joseph Horvath, W6GPB. RM: RBQ. ECs: DOT, KZP. OO: NJW. OBS: FVK, KNH, DJI. ORS: RFF, BIP, ATY, RBQ, CVP. OPS: OZC, NYQ. DOT returned from vacation and fired up the rig on 14 Mc. with fine signal. DJI and family returned from Lake Tahoe too late for the ORS/OPS Party. MOD is on 7- and 14-Mc. c.w. AUN is on 28-Mc. 'phone and 7-Mc. c.w. WCD is on 28,824-kc. 'phone. AOV is running 'phone and c.w. on 28 and 14 Mc. GTI has kw. on 14-Mc. c.w. JDP is going in for h.f. 144 Mc. and up. PKI, now of Redwood City, is completely rebuilding shack from ground up. At present Joe is on 144 Mc. only. We have a fine active bunch of h.f. men and it is my pleasure to report another h.f. record broken by this section. On July 5th VQB and URA made 96-mile two-way contact on 420 Mc. On the same day VQB made contact one way with 9OAW, a distance of 126 miles. Receiver failure at one end prevented this from being the 420-Mc. record. RBQ is going out with his sixteen-element beam to boost the 144-Mc. record again. RBQ has new two-element 14-Mc. beam and a new Super-Pro receiver. VQB is installing high-power 420-Mc. rig at home QTH. He intends to run it as automatic beacon band-spotter at the center of the 420-Mc. band, 425 Mc., plus or minus 1 Mc. ZF dropped in July 12th to say hello to some of the San Francisco gang. He has his discharge from the Air Service and is anxious to get going again, but is unsettled as to just where he will locate. R. G. Martin, Wm. Ladley, J. L. McCargar, and I visited the Marin Radio Club the same evening. J. L. McCargar gave a talk on the recent ARRL Board Meeting and Headquarters activities and answered questions on past and proposed actions concerning the League. The usual bang-up meeting was enjoyed by all present. At the July 26th meeting of the San Francisco Radio Club an excellent talk was given by Dr. Warren on microwave technique in regard to transmission lines and wave guides and their use as impedance matching transformers, tank circuits, and reactances. Nominations were in order for new officers of the club to be voted on in forthcoming meeting. Have received no reports on ORS/OPS Party scores to date. 14 Mc. was very poor because of sun spots. However, 7 Mc. seemed alive with competition. Now that the excitement is over on the opening of the 3.5-, 7-, and 14-Mc. bands let's have some good monthly reports and news items. Drop me a postal before the first of the month. Thanks. Traffic: W6RBQ 170. *Sam.*

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ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wortman, W4CYB — Thanks to the Greensboro gang for a swell hamfest. Those of you who missed this one missed a real good time. The fellows must have had more than a hundred prizes as we won our first in almost fifteen years of hamfest attendance. Official registration was 279. The next meeting is to be held in Winston-Salem. 9WMI/4 has been active on 50 Mc. as has HVV and HUT. It is reported that four states have been worked including Arizona, which is fair DX for this band. The fellows will be sorry to hear of the untimely death of FJS, who lost his life in an airplane crash. MR is grabbing the DX on 14-Mc. 'phone with 800 watts and a 7/2 wave Q. DSO spent considerable time in the hospital, but now is out. ANU, AAU, CYN, DGU, CTP, AHH, and DKG are active on 3.9-Mc. 'phone. Be sure to take part in the North Carolina-Virginia Fall Field Day Contest October 5th–6th. Let's try to beat the gang in Virginia. This contest is sponsored by the Raleigh Amateur Radio Club, and details will be available from this Club. All organized clubs that have not already done so should send in recommendations for EC. Other applications are invited. There is a small amount of traffic being reported. Please let's hear of your activities. Thanks, fellows.

SOUTH CAROLINA — SCM, Ted Ferguson, W4BQE/ANG — JGM is new ham for this section. DPN is working 3.9-Mc. 'phone and building u.h.f. gear. DX reports activity at Camden. BAT is EC for Charleston area. HSM has new BC-610 rig and works 28 Mc. GFP is doing nice job with pair of 812s on 3.9-Mc. 'phone. IZQ, with his 809 final and folded dipole, is really working them on 28 Mc. GTW is using an 812 and has swell signal on 28 Mc. ITJ works 3.5-Mc. c.w. and 28-Mc. 'phone. HOY is on 3.5-Mc. c.w. and is looking for the 3.5-Mc. gang. FNS and AFQ are looking for material for their ORS and c.w. nets. 9ZZW/4 and the bunch at Ft. Jackson are keeping things going. BPD has a kw. for each band with a 48-tube receiver. FBD works 3.9-Mc. 'phone. BEN works 28-Mc. 'phone and 14-Mc. c.w. CEL works 3.9-Mc. 'phone. BQE has new rig ready for all bands. CXO is beating them out on 3.9 Mc. 9QHS/4 is back at Ft. Jackson. HJR works 3.5 and 7 Mc. and finds traffic handling a lot of fun. FNT sends nice list of DX worked from Okinawa and is looking for W4 contacts. The Palmetto Amateur Radio Club has inaugurated a 28-Mc. local night net known as the "Hoot Owl Net." We need ORS, OES, and ECs. Traffic: W4HJR 8. 73. *Ted.*

VIRGINIA — SCM, Walter R. Bullington, W4JHK — EOP, 3308-A Second Avenue, Richmond, is new RM. Anyone interested in traffic handling or starting a net, contact him. 3GKL now is 4JHK. BZE has been conspicuous by his absence of late because he acquired an XYL June 10th. Congrats, Tom, from the gang! EOP just received his Code Proficiency Certificate for 35 w.p.m. BZE has new bandswitching exciter. The SCM would appreciate the coöperation of all Virginia hams, especially ORS and OPS, in sending in their monthly reports. Traffic: W4EOP 44. 73. "*Monk.*"

WEST VIRGINIA — SCM, Donald B. Morris, W8JM — DFC has resumed duties as RM for Southern West Virginia and all in that part of the State interested in nets and traffic are asked to contact Hutch. MOP blew filament on 250TH just before OPS Party. QFN, formerly of Huntington, now is 4IJV, in Orlando. SPY is new OES and active on 50.1 Mc. The Fayette Radio Club meets 3rd Sunday of each month. USO has new HQ-129-X. UDB has new 150-watt 7-Mc. rig and a new HRO. VAN, CHP, and AHZ are DXing on 14 Mc. QHG is on 3.9 Mc. CSF, Kanawha County EC, has a swell portable rig using 807 and a 500-watt generator mounted in a truck. The Charleston Radio Club reorganized with thirty present at the first meeting. SEN and ORD work at WMON. GBF, REH, GAD, JM, MIS, KWL, FMU, YGL, FEO, BTV, DYB, TCP, CWY, JDJ, and AZD attended Pittsburgh hamfest on Aug. 4th. BOK, DFC, and SPY are new ECs. YLE is new station in Clarksburg. Interest is picking up in the WACWV Contest with several stations getting on the air in counties that heretofore were vacant. 'Tis rumored that there may be a nice prize along with the certificate to the first one getting fifty-five. Traffic: W8KWL 6 GBF 5, JM 4, DFC 2. 73. *Don.*

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Amateurs—

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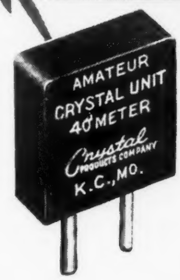

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ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Glen Bond, WØQYT — ØEGH, in Colorado Springs, sends this dope in. He has a pair T55s on 3.5-Mc. c.w. KKY should be on 3.5-Mc. c.w. by now. SWM is on 3.9-Mc. 'phone with an experimental rig. EVT and GBX (XYL and OM) are doing an FB job handling traffic from the Pacific Islands on 28-Mc. 'phone. HDU is on 14-Mc. 'phone at his new QTH. FBF and IHO are on 3.5-Mc. c.w. YLT is on 3.9-Mc. 'phone and 3.5-Mc. c.w. JVR and IOH are on 28-Mc. 'phone and 3.5-Mc. c.w. KMS is building a 500-watt rig with 75THs in the final. IQL is also building. NWQ has a 1-kw. rig in the building stage. ZKM is working 7-Mc. c.w. and 28-Mc. 'phone. KVD has a new rig on 14-Mc. 'phone. 1MMO/Ø is on 28-Mc. 'phone. ØEHC came up from Oklahoma City and visited HDU, EGH, JB, and FXQ. Carl has an NC-200 receiver. 4AXG/Ø, at Canon City, has a new HQ-129-X and is putting up a plumber's delight at his new QTH. ØBZV, ØTHQ, and another ham at Akron, Colorado, are planning some 400 Mc. work in the near future. All three worked for CAA. BZV is on 3.5-Mc. c.w. but expects to be on 14-Mc. 'phone soon with an 814 in the final. THQ is on 3.5-Mc. c.w. now but will be on 14-Mc. 'phone later. ØYTY was up on Mt. Evans a few nights back and his mobile 28-Mc. rig sure put an FB signal into Denver. QYT was on Pikes Peak August 4th with a 28-Mc. mobile rig, 12 watts input, and worked 1MMO/Ø in Colorado Springs, IXM in Littleton, AAB, KPT, 7JDB/Ø, and mobile YTY in Denver, but could not raise the W5s that were coming in on short skip. 73. *Glen.*

UTAH-WYOMING — SCM, Victor Drabble, W7LLH — 7FST, of Sandy City, a real old-timer, writes that he handles over three hundred messages a month. 9NFX is going to school in the East. 7RIM is getting on with an 812, 'phone and c.w. 7JSN just got his license. 9FVO now is 7JQU. 6HUT just returned from the Navy. 6SID has a new relay rack for his rig. 7CKI gets on 14 Mc. with a pair of T40s and a rotary beam. 6SID and 7JQU participated in the ORS Party. 7DTB is having bug trouble, but in the hay and beets, not in the rig. 7RIM joined the ranks of the benedicts. 1RK is stationed at the Clearfield Navy Depot. 7DLR's call was changed from W6 to W7; he has his center-fed antenna connected to the skyhooks. 7LLH's call was changed from W6 to W7. He gets on 7-Mc. with about 60 watts. 7UOM has his 28-Mc. antenna working and got a ZS contact with it. ØIUG, in Cheyenne, is waiting for his passport to the Philippines to hold down an electrical engineering job for the G.E. Co. While in the Islands he plans to get on the air with a kw. on the 14-Mc. 'phone band and expects to beam his signals at Cheyenne. 8IFB, of Claysville, Pa., is in Cheyenne and tells of his experiences in a Jap prison camp with a hidden receiver. 73. *Vic.*

SOUTHEASTERN DIVISION

ALABAMA — SCM, Lawrence J. Smyth, W4GBV — Asst. SCM, Charles L. Herman, jr., W4APJ. EDR is rebuilding. IDZ sold out to GWF. GOX has a brand-new XYL. 6ANM/4 entertained the Montgomery Club with color movies he made in New Mexico at the firing of the German V-2 rocket bomb. EW is pounding brass at WCLB. GBV visits clubs all over the State in the course of his travels. AUP took a small portable rig along on his Florida vacation. Thanks to HFL and AKP for the Tuscaloosa report. IAT works 3.5 Mc. every night. BEB says he is on 3.9 Mc. and broadcast band. GET is on 3.5 Mc. when skywire is off the ground. ELX is building a concrete block shack and has 250 watts ready to go. HAI, 8WAT/4, and DAQ are attending U. of A. HFL is back on 3.5 Mc. JX has a new SX-28 and HT-6 stored. HCV wants to hear from GVG. DMV has received his old call and is looking for a place to live in Dothan. FUM gets into Montgomery FB when skip is right on 28 Mc. What has happened to DGS? IVC is building a modulator for his 807 final. GWF doesn't get enough time in front of a mike at WSFA; he also works on 28 Mc. GAG is very active on 7 Mc. DPX says the new rig is slowly nearing completion. Traffic: W4DXB 5. *Charlie.*

EASTERN FLORIDA — SCM, Robert B. Murphy, W4IP — Both 'phone and c.w. nets are in the process of organization under the guidance of BYF and ACZ. The ORS Party was a humdinger for BYF, 14,733 points, 79 stations in 32 sections. Mac now is EC, OBS, ORS, RM, and president of the local ham club. Activity is requested in various parts of the section for some v.h.f. experimental

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work on 50 Mc. with QN, 1NWE/4, and GIY. VV, FVW, and BYF are on 144 Mc. with some time devoted to 50 Mc. IPW is working some DX in a mobile unit on 29 Mc. EYI sends in clippings and items as follows: HUY has a 14-28-Mc. beam; EPW has old call, GA, back; FJC reports the JARC is active; FJC, HWA, and FRG are on 29 Mc.; the Knights of the Kilocycles is getting new members from the Jacksonville crowd — FJC, FWZ, IVX, and EEZ; DLL has his old call again; UJ has code class going for JARC; FWZ is Duval County EC; FJC is OBS. Lake County may have an EC with AYV returning from Johnson City, Tenn. IP, your SCM, is on 3615.5 kc. and is looking for all QSOs from his "flock." ASR is Volusia EC. ACZ is Palm Beach County EC. K6IRS is Monroe County EC. The TARC is active on all bands. New officers are AFU, pres.; DES, vice-pres.; GEE, treas.; and ALP, secy. DUG will be the club station call. The Dade Radio Club closed its contest for working all states. GNT made a liberal prize donation from PAA surplus. VV and IMI are doing good with QSLs. By sending a self-addressed envelope or attending DRC meetings you may obtain W4-Miami QSL cards. DKA has worked his sixtieth foreign country and is looking for a special receiver, single signal, to cut the QRM on 14 Mc. HLV, in Balboa for PAA, reports 14 and 29 Mc. coming in fine. DQW now is ORS. Applications for OPS have gone out to the Knights of Kilocycles. ACZ will promote this as PAM. Traffic: W4BYF 65, GVC 9, BNR 8, EEW 6, AFV 5, BIF 2, DQW 2, GNS 1. 73. *Merf.*

WESTERN FLORIDA — SCM, Lt. Comdr. Edward J. Collins, W4MS — JNP is active on 7 Mc. JBI is fighting bugs in his rig. AXP and DAO are rebuilding into FB cabinets. FHQ is enjoying 7 Mc. 2OTU/4 and 5IAO/4 are enjoying 28 Mc. 6OHN/4 is married and the XYL takes to ham radio. 4QK is gradually building to high power. VR and EQZ are busy with police radio. JV is pulling in the DX. EQR has new HQ-129-X. HHX is heard working 14 Mc. HJA is pounding the best signal on the air. 3IHC/4 now is 4JJU. 1DBT/4 is building a beam. HIZ is on 7 and 144 Mc. EGN works 14 Mc. with an attic antenna. DZX works on transmitter between reels at the movie theater. QG and BFD are applying for their old calls. ECT and FJR are having FB time on 7 Mc. IVY is after a bigger sock on the air. BKQ just about has the big "peanut whistle" ready. AXF wants OM to leave her transmitter on 28 Mc. MS still is assembling 14-Mc. "peanut whistle," but finds time for 7-Mc. QSOs. 73.

GEORGIA — SCM, Thomas M. Moss, W4HYW — The Emergency Corps is active in several of our counties. New Ware EC is ERS, who also is an OPS. GCD is new Lowndes EC. BAC, GZV, GEG, and GJZ are active in Emergency Corps. IKJ is new OO (Class I). HYW is new OO (Class III). FIJ has been appointed ORS. Our newest OBS is BQU, brother of BOL, our Bleckley EC. We are glad to announce the return of GLE (Marietta), INO and JGP (Atlanta), GEG (Cartersville), HD (Hapeville), GFJ (Hiwassee), and ALW (Savannah) to ham radio after serving in the armed forces. GQR and GEG are planning to join the ultra-high gang on 50 Mc. soon, and ERS is exploring 144 Mc. JBW is a student at Tech Hi (YC). His dad is ex-4DG. OA4M has been in Augusta and was a visitor at the Savannah Hamfest. TO now is in Atlanta. 9RPA is on from Decatur. IAB is now in Cartersville. KS4AA, on Swan Island, is interested in schedule with the Atlanta gang. His QRG is 3690 kc. The Savannah gang had a very nice hamfest. If you missed this one, it will be worth the time to attend next year. The Old Timers Club is open to those who held a ticket twenty years ago. Prewar members of the Twenty Year Club should apply for membership in the new club. See June *QST*. U.h.f. stations are urged to take part in the V.H.F. Marathon. Rules in May *QST*. Don't forget to send your envelope for QSL cards to W4MS in Pensacola. Prewar cards will be destroyed on January 1st. Best of luck and DX. Traffic: W4HYW 16. 73. *Tom.*

WEST INDIES — Acting SCM, Everett W. Mayer, KP4KD — KP4AB passed away after a short illness. New KP4 calls: BD, ex-K4GNC; BI, ex-K4EMG-W2OJV; BJ, ex-K4HEB; BK, ex-W4DYX; BL, ex-K4HQU; BM, ex-W3JGG; BN, ex-W3JOD; BP, ex-W3JLH; BW, ex-W4DAN. New-comers are KP4AC and KP4AW. UG has RME-45. JA has 300-watt p. p. 812s on the air. 4AM, new OPS, added three new countries for a total of eighteen, and installed new rotary coax-fed dipole. BJ added three new countries for a total of twenty-three. BK has FB home-

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grown 802-807 v.f.o. W4BZA/KP4, on 14-Mc. 'phone/c.w. with HT4, also works 7-Mc. c.w. W8VRD/KP4 is working on 1-kw. rig. RJ has new Navy RAK receiver. K4EYP is on 14-Mc. c.w. portable in W2. 4LW, 4BI, and K4EJG is active on 28-Mc. 'phone. EJG is on 14-Mc. c.w. Get your envelopes in to the KP4 QSL Manager, fellows. AZ is knocking out WACs on 28 Mc. with choice ones like EL4A, XV2VV, and KG6. Traffic: KP4AZ 2, KP4KD 2. 73. *Ec.*

SOUTHEASTERN DIVISION

LOS ANGELES — SCM, Ben W. Onstenk, W6QWZ — The Tri-County Amateur Radio Association is affiliating with the League. This club maintains radio communications with the Boy Scout camp at Camp Tulakes and has for many years. VZF was operator at the camp and QE operated in Pomona. IWU was the call used at the camp. UFJ and VU are sharing the rig on 3.9 Mc. The Foothill Radio Club is sponsoring the AEC in that area. ON, MJU, EBK, FFN, VXM, and VQO are on 144 Mc. in the Foothill area. MEP is using a three-element beam on 28 Mc. feeding it with seven hundred feet of six hundred ohm line and says long wire is no good down in the canyon. VOZ is arranging schedule with 8ECN for fast coast-to-coast traffic on 14 Mc. Traffic-minded hams should contact VOZ or IFW on 3810 or 3830 kc. VOZ is in Victorville and IFW is in Hollywood. FHQ is reporting again and is on 14 and 3.9 Mc. with a kw., handling So. Pacific traffic. TZD reports traffic from Greece. CMN reports that GJP, LBM, and UVB are back on. AM worked six J stations with his Japan rhombic on 14 Mc. VTC, ex-3IVZ, has moved to Roscoe to experiment with antennas. MSO, the Centinella Valley EC, reports contacting the local Red Cross and making plans to serve as their communications. They continue to hold regular Monday night drills and emergency runs. The net consists of MSO, QIR, RNN, EKM, VES, URN, EKW, PNH, QXB, USK, 5OH, BOB, RZK, SJF, UXN, and SQC, all on 144 Mc. That's all for this time. Traffic: W6QE 60, TZD 19, VOZ 10, AM 9, CMN 8, FHQ 8. 73. *Ben.*

ARIZONA — SCM, Gladden C. Elliott, W6MLL — Most of the gang have their 7 calls now. QWG is on 3.5, 7 and 14 Mc. 5JFG/7 has all districts on 50 Mc. QAP has six districts on 50 Mc. and is going on 3.5, 7, and 14 Mc. JLZ, TCQ, and JKK are on 3.5 and 7 Mc. NRP is on 7 and 14 Mc. UMF works 3.5 to 14 Mc. SYK works 3.5 to 28 Mc. at Williams and has a fine club going there. TJH and 5GZR/7 are on 3.5, 7, and 28 Mc. GS has a revamped rig on 28 Mc. JKN and OWX have gone on 50 Mc. New Calls: JMA, JMB, JMR, JJW (ex-6ACN), JPY (ex-6JHF), JMC (ex-8PXQ). QLZ has a mobile rig on 160–2. JHF is mobile on 28-Mc. c.w. BMC is back on 3.5 and 7 Mc. with his old call. OPV and SOG are on the air. KMM worked twenty-one districts in the ORS Party. LSK is new Phoenix EC. The Phoenix Club sponsored a Salt River Valley QSO contest Aug. 10–11. JFW is on 7-Mc. with vibrapack. JQP works 7 and 14 Mc. JFG, GS, JIW, UCP, and PEY get good results on 28-Mc. folded dipoles. RMB has rig gremlins on 28 Mc. NOY is visiting friends in Arizona. RXP is on 7 Mc. SCK is on 7 and 28 Mc. JGZ and SBN are on 3.5 Mc. QNC is airborne on 144 Mc. MAE handles Phoenix Boy Scout traffic to Prescott. UPF is on 14 Mc. UPR is building a rig for SMZ. 73. *G.C.*

SAN DIEGO — SCM, Ralph H. Culbertson, W6CHV — LUJ is on 7- and 14-Mc. c.w. working some very FB DX, including VS4JH, W8LZK/NY4, VK6FL, ZS6GF, W4FGW/J2, LU7CD, KA1AE, W6TZB/J9, and F3LK. LUJ is one of the section's outstanding traffic stations of pre-war days and he is all set to resume his FB record. ACW is reported to be back on 14-Mc. 'phone at the Naval Air Station. He has a new FB rig going with a pair of 250THs and is building a new three-element rotary beam which should be up very shortly. He also reported working some FB DX the first night on the air, HK3 and a portable J3. BAM reports working his rig over and replacing his 100TH with a pair of 127As with about 800 watts input. FGU is on 14-Mc. 'phone with about 350 watts and an FB three-element beam and worked D4OOU in Germany and 8QEN/CP-2 in the Azores. SIG is proud papa of a 9-lb. jr. operator, named Don Fredericks. PAX has just completed a new FB 56-foot tower and is working on a 28-14-Mc. three-element rotary to put on top very shortly. LUJ and PAX renewed their ORS appointments. ACW is new OPS for the section. QEZ, in New York City going to school, received his new call 2QPZ, and expects to be on 14 Mc. soon with about 500 watts and would

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like to have the gang keep an ear out for him. EZM has moved to La Mesa and reports an FB location for shack and antenna. APG has a new HQ-129-X receiver and reports working his first TG9 in Guatamala on 28-Mc. 'phone. How about some reports from you fellows in the San Diego Section? Traffic: LUJ 14, BAM 2, CHV 2. 73. *Ralph.*

WEST GULF DIVISION

NORTHERN TEXAS — SCM, Jack T. Moore, W5ALA — Section EC: DAS. RM: CDU. PAM: ECE. Helen Douglas, of Commerce, now is LGY and advises the following LSPH have received their calls: KUV, Earl Herndon; KUP, Jerry Murray. JBD has a Class A ticket. FRD is doing good work on 50 Mc. EVI attended the Field Day get-together of the East Texas Radio Club at Caddo Lake. BNQ has a new NC-240 receiver. Now that EHZ has received permission to erect an antenna he can't find anything but knotty 2x4s to use for poles. Ross sends the following: SP is awaiting delivery of a Super-Pro; AAO has a new BC-610 transmitter and reports working Christmas Island on 28 Mc.; GFL is looking for a power supply for an 813; QA is ready to go on all bands as soon as the weather cools down; DUZ has rebuilt his rig, is running 200 watts to a pair of TZ40s and has put up a new antenna. NW is working 3.5, 7, and 14 Mc. and has agreed to run for reëlection as director. GFN and HVQ are working lots of DX on 28 Mc. KUC has worked fifty-seven countries on 28-Mc. 'phone. CWW now is 6UUD. CVW has a new S-36A receiver and has increased power. Dale Westbrook (LSPH) has received the call LLK. CF is an old-timer gone modern with a new Panadapter and a BC-610. Fellows, this report completes my term of office as your SCM and I want to thank you for your fine coöperation. Since I have been nominated as candidate for alternate director I will not run for SCM, so please nominate someone for this job. 73. *Jack.*

SOUTHERN TEXAS — SCM, James B. Rives, W5JC — KVD has a new rig with 150 watts on 7 and 3.5 Mc. Other active stations at Austin are DCS and LDA. All members of this section will be grieved to know that IQU was electrocuted while working on his rig. It should remind all of us to practice safety at all times. LMA is a new station in San Antonio on 7 Mc. HME has 75 watts on all bands. EUL is collecting the necessary items for an elaborate antenna system. HJY has constructed a number of rigs using 813s for the fellows around San Antonio. HBQ got a bad burn off of his high voltage supply. The Houston Club has an active and enthusiastic membership with present officers as follows: IGS, pres.; IGJ, vice-pres.; HAQ, secy.; FWC, treas. Meetings are held each Friday in the Houston Chamber of Commerce Building. Those active on the 144 Mc. band are: FQQ, HFO, GSL, IYF, 6UOR 5, IGS, ON, GLS, BHO, HAQ, FI, EAL, JMI, KFY, EIB, JIY, AZR, IGL, LGR, and LGE. Also UW, of Missouri City, and KFD, of Cedar Buyo, are contacted regularly in Houston. The Galveston gang is taking steps to reactivate the club there. ADZ has an 813 final and a beam in the attic with which he worked all continents in two hours. TG is moving to Houston. LBH is having difficulty with the new receiver under construction. LLH is active on 7 and 14 Mc. with 60 watts. IGJ is constructing a kw. with all the trimmings. EEX has taken time out for a honeymoon. EIB is on all h.f. bands with separate antenna for each. LCL and LDI are with the CAA, stationed 120 miles east of El Paso at a lonely outpost where amateur radio really means something. Their activity so far has been confined to 28-Mc. 'phone. LDD has moved to 14 Mc. to compete with the QRM. He advises there are a number of kw. rigs under construction at Brownsville. EWZ recently completed his four thousandth QSO. 73. *Jim.*

NEW MEXICO — SCM, J. G. Hancock, W5HJF — Louis, senior operator at ZA has been under the weather with a strep infection of the lung the past few months but is improving now. He and Eunice (the chief operator at ZA) are building a new 900-watt rig to work on 3.9, 14, and 28-Mc. 'phone and c.w. ICD is planning on settling down in the Verde Valley of Arizona and he and JXL (the XYL) have applied for W7 calls. They send regards to all the New Mexico gang. 9NGL is located at Carlsbad. Mr. White, ham-to-be of Altus, Okla., visited the SCM on his way to Carlsbad Caverns and delivered some "war surplus" to HJF from 5BHD. HJF is having lots of fun on 14 Mc. I can at least hear other people calling the gang there. Why "don'tcha" come down to 3.5 and 7 Mc. and be sociable, gang. 73. *Jake.*

(Continued on page 102)

(Continued from page 100)

CANADA

MARITIME DIVISION

MARITIME — SCM, A. M. Crowell, VE1DQ — Some nice DX cards await the following: NX, DR, KU, RA, PJ, LT, AE, AW, CE, CK, CU, CW, DB, DR, EA, JP, EL, EP, HI, ID, MV, EV, FB, GU, KN, KS, KX, KU, OD, LY, NC, NX, NY, PB, PK, PT, PV, QJ, and RH. Please send in stamped return envelope to FQ, QSL Manager. TH, new Halifax man, has home-built super. Ex-KG, now VE2SU, in Montreal, handles some VE1 traffic. VO4F has returned to VE3-land. RF pounds out with 813 final. HARC will buy a gas-powered generator with money recently raised for emergency gear. HJ has vibrapack rig and is AEC member. 1AYL sends nice report on St. John gang. LARC meets the second Tues. each month and welcomes visiting hams. Ken Cox, sporting new receiver is awaiting new call. FC is on 3.9-Mc. c.w. JO also is on the 3.9-Mc. band. GQ is active on 28-, 14-, and 3.8-Mc. 'phone bands. GP is using the super antenna with 450-ft. Zepp feeders. IE is working on his 3.8-Mc. 'phone. FK is on 3.8- and 28-Mc. 'phone. HL and IL are rebuilding. FL and AYL are active on 3.8-, 14-, and 28-Mc. 'phone and c.w. New St. John calls: PI, RQ, and SJ. EI is going strong on 3.8-Mc. 'phone. AK chats regularly with AU on 28-Mc. 'phone. FU is rebuilding for 14-Mc. 'phone and c.w. CO has been on vacation with portable 3.5-Mc. rig. BD is knocking 'em off on 14 Mc. RG is doing some constructing. CW is active on 3.5 and 7 Mc. CW called on GK, JD, and DZ while on a flash tour to Nova Scotia. Traffic: VE1HJ 7. 73. *Art.*

ONTARIO DIVISION

ONTARIO — SCM, David S. Hutchinson, VE3DU — OI got tubing for 14-Mc. beam. TM can't find ambition to rebuild in hot weather. WA worked four continents one evening. CP is on but is looking for a good receiver. AHL is busy making plans for new QTH. WD is coming on with 814 final. AQC is new Amherstburg station. FP has FB skywire. AEP and his XYL visited with WX. PU is increasing power. MY's XYL wants a mike after hearing Mrs. AEP. ALE has new Millen exciter. CP, his XYL, and his jr. operator paid WX a visit. OI has been entertaining the Windsor gang. WA would like an invisible skywire. QK is searching for a place to live. TB, GT, and QK ran GT on Field Day along with BCZ. ATB and ANY work 50 Mc. ADR, AAG, QW, BAD, CAR, ANQ, KE, 2FG, 3ARS, BCZ, and HP formed a net to assist Ontario Flying Club at Air Show in Oshawa. AVA and AZA are on from Malton. AZI is building large high-power rig. KM called until he was hoarse during the ORS Party and then didn't make a QSO. Yours truly paid a visit to QK, GT, WK, and SG while on vacation and in turn was visited by ZE while staying at the Hotel. Sorry I could not get around and see more of the gang. AUQ is working on 14 and 28 Mc. HI, BEV, AJE, CM, ADC, and GB are active on 14 Mc. KC was home on a visit while awaiting posting with RCN, and doing some brasspounding on the side. BJI and BLD were heard on 7 Mc. How about some reports of activity from eastern Ontario? I cannot fill up our quota of space without news from the gang, so what say, fellows? It may be the hot weather, but the C.D. appointees are not sending in their reports as required. So, boys, please report even if there is no activity, as reporting is necessary if you want to hold your appointments. We still are looking for applications for ORS, OPS, RM, EC, and OBS appointment. There is plenty of room for new appointees. Traffic: VE3ATR 6, OI 6, VD 1.

QUEBEC DIVISION

QUEBEC — Acting SCM, W. Stephen, VE2LC — TH has transferred his powerful 'phone to 14 Mc. IL has a self-excited oscillator on 7 Mc. EP has scuttled his 828s and is trying out a pair of 814s. HS has been demobbed from the Air Force and is back at Sun Life. He is on 3.9-Mc. 'phone. LV gives up hamming in favor of golf in the summer. SU is trying hard to iron out the bugs in his v.f.o. II gets out well with a pair of 46s. "It's all in the antenna," he says. VN and VV are new Montreal calls. Old-timer FQ now is located in Mont Joli. IY has a new home in Mount Royal, where he has put up a 14-Mc. rotary beam. SM has antenna trouble because of lack of roof space. VK2JR, chief design engineer with Amalgamated Wireless, is staying in Montreal for a few months and gave an interesting talk on hamming in Aus-

(Continued on page 104)

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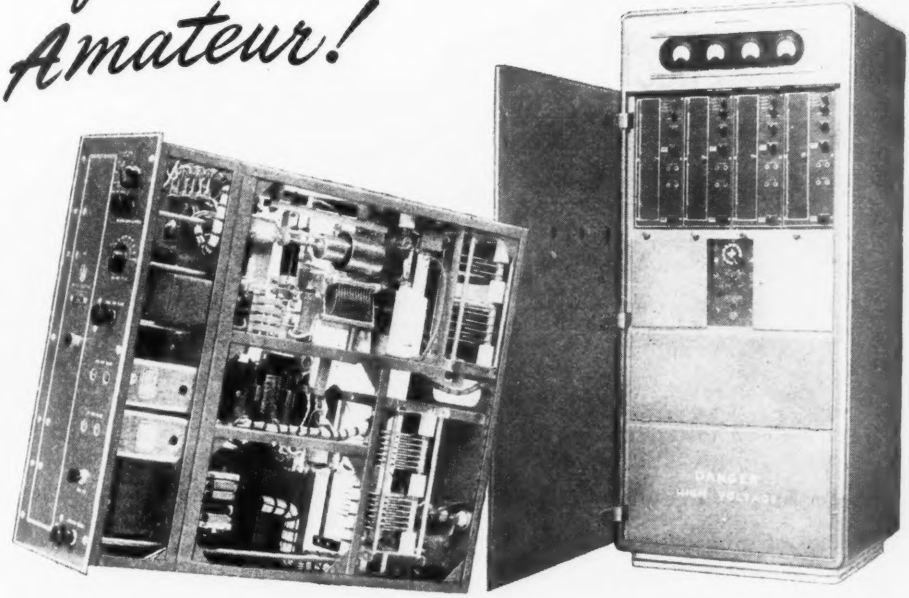

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(Continued from page 102)

tralia at the July meeting of the MARC. II, SU, and LC are ORS. HF made a trip to the Pacific Coast and rag-chewed with 7TD, who was 2CX prewar.

VANALTA DIVISION

ALBERTA — SCM, W. W. Butchart, VE6LQ — HM has new HRO and has pair of 831Bs in final. 8AG is new call of 6IJ at Whitehorse, Y. T. He is busy erecting rhombic antenna. MJ works out FB on 3.9-Mc. 'phone. EL, of Camrose, has license endorsed for 14- and 3.9-Mc. 'phone. LG dragged home first prize for v.h.f. equipment at Calgary 'fest. QE lives in Edmonton but works in Calgary. 5DW (ex-4ADW) is visiting the Edmonton gang. IR is new Edmonton call belonging to "Perk" Perkins. EA is experimenting with new type final amplifier. PP is using QRP rig at Sea Cadet Camp on Lake Wabamum. DN, of Glenwood, puts terrific signal into Edmonton on 3.9-Mc. 'phone. AH has new rig practically complete. SZ has rig on 3.9-Mc. 'phone, using single 813 to good advantage. AO is back on the air with a rebuilt rig. He is getting out FB on 7 Mc. LQ has gone v.f.o. WS has combination 14-28-Mc. beam ready for action. HQ, of Calgary, and LQ, of Edmonton, worked 3.9-14 Mc. cross-band QSO (200 miles) with S8 to S9 reports, then worked straight 14-Mc. contact. EL, of Camrose, worked UT, of Edmonton, on 14-Mc. c.w. short skip, with S9-plus signals both ways, and they were heard in Calgary S9 at the same time. Traffic: VE8AO 48, 6LQ 18.

BRITISH COLUMBIA — SCM, W. W. Storey, VE7WS — The new SCM wants the "tops" in regard to active news from all clubs in B. C. Please try to appoint a member in each club to be held responsible for gathering the active news. Come on, fellows, show what you can do. You know I can't do it all — it takes coöperation! So, what say, BCARA East Kootenay, Point Grey, Royal City, Victoria, West End, UBCARA Vancouver, Kelowna, Dawson Creek, Langley Prairie, Collingwood, Totem, ARC. 7AIG is back in the RCAF. 7JK heard PZIA (Dutch Guiana) on 14-Mc. 'phone frequency 14,325 kc., 9:30 P.M. (D.T.). 7AEZ worked two W6s on 50 Mc. The Air Force Amateur Radio Net is really going full blast now. 7BQ is trying crystal-control on 50 Mc. Hi Totem Club had a crystal-grinding bee and plans to put on another one. 7XS has just finished building a new transmitter and receiver. 5AEY has put up a 28- and 14-Mc. three-element beam. W6s are looking for contacts on 50 Mc. every night up to 5 P.M., including Saturdays and Sundays. Did you hear the latest, gang? 7OT (Jack Benny) and TA (Edgar Bergen) went to town on July 21st. (It sounded like Jack was trying to play "The Old Rugged Cross" with a bit of arthritis added to it, while Edgar took it painfully, with tears rolling down his cheeks.) The Vancouver Amateur Radio Club meets at the home of 7FB. Membership now is twenty-five and rising rapidly. Officers are: 7TR, pres.; 7ADF, vice-pres.; and Tom Grant, secy.-treas. Let's have lots of dope, gang. 73.

PRAIRIE DIVISION

MANITOBA — SCM, A. W. Morley, VE4AM — With the return of 14 and 7 Mc., activity hit a new high. The following are active on 14-Mc. 'phone: KU, AC, QV, EK, KX, WF, QI, KF, SR, CC, MN, and AD. CW finds RO, TV, BQ, and AH hard at it. HI (ex-IH), SH, and TJ are dividing their time, 'phone and c.w. 7 Mc. is not so popular. So far the following have been heard: JM, RO, and BN. RO has worked quite a bit of DX on this band. ABV is now signing XO. DM is signing VE1. 56 Mc. is showing some activity but it is low now because of holidays, etc. The following are active: CD, DG, HW, KO, XH, GM, and BI. DG has turned in a nice list of DX heard on 56 Mc. and it includes a W2. Crystal-control and superhets are in line for the fall and it is expected that 56 Mc. will be a "hot" band this winter. The WARC has its constitution thrashed out and now is down to brass tacks. Meetings are held every month and some very interesting talks are scheduled. CU next month. 73. *Art.*

Strays

A. Claudet, F8AJ, invites W hams on duty at (or traveling through) the airdrome at Orly, France, to visit his home. QTH: *Fallie des bois*, Orly, 50 yards from *Chateau Feugeas*, a villa reserved for the U. S. Army.

Bandswitching Transmitter

(Continued from page 21)

to use the rig on c.w. only may find the use of a fixed screen supply more satisfactory than the screen dropping-resistor method, although means must be provided to remove screen voltage whenever plate voltage is removed to prevent damage to the tube.

Table II gives representative voltages and currents under operating conditions. Some variation from these figures can be expected depending upon the actual supply voltages used, but they will serve as a general indication, useful in checking performance.

TABLE II

Operating Voltages & Currents

Conditions of measurement: transmitter tuned for 10-ma. grid drive to 4-125A, 28-Mc. output. Supply voltage, 430. Readings obtained with 20,000-ohms-per-volt meter.

Tube	*Element*	*Volts*	*Ma.*
6F6	Plate Screen	128 70	6
6V6	Plate Screen	360 9	6
6N7	Plate 1 Plate 2	340 300	12 28
807	Plate Screen Grid	430 340 -90	28 3 *
4-125A	Plate Grid Screen	2000 -200 350	150 10 30

NOTE: Plate current, and screen voltage and current, in 4-125A, are dependent upon external loading.

* Less than 1-ma. grid drive to 807 required to produce 10-ma. drive to grid of 4-125A.

With the layout used no instability was observed when the crystal was removed with all circuits tuned up. As a check, with the crystal removed, apply plate voltage to the low-power stages, and rotate each of the tuning condensers through its range while observing the plate current of the stage to determine if self-oscillation occurs. Plate current should remain constant if the desired stability has been achieved. Rearrangement of some of the wiring to eliminate stray coupling may be necessary if oscillation is present under these conditions.

The transmitter may be operated with a separate VFO unit as its frequency control by removing the crystal-oscillator tube from its socket and feeding the output of the VFO between the plate pin of the oscillator socket and ground. Adequate drive for either 'phone or c.w. operation can be obtained on all bands with a VFO such as that

(Continued on page 108)

(*Continued rom page 106*)

described in September, 1946, *QST*.[2]

It should be noted that this method is satisfactory only in cases where direct coupling will not short-circuit the plate supply. In other cases, the VFO should be coupled through a 0.001-μfd. blocking condenser.

[2] Mix, "A Simple VFO Crystal Substitute," *QST*, September, 1946.

Preventing Self-Oscillation

(*Continued from page 28*)

14 Mc., satisfactory operation at 50 Mc. might be hard to obtain.

At present my rig has the following tube lineup: 6SJ7 ECO; half of a 6SN7GT, doubler; half of a 6SN7GT, cathode-follower driver; and an 807 final amplifier. The circuit is shown in Fig. 2.

A tetrode can be used as a cathode-follower driver, as shown in Fig. 3. Note that the screen grid is tied to the cathode through a large condenser, and the screen voltage is fed from the plate through an r.f. choke. Otherwise the circuit and operation are similar to a triode-follower circuit.

There are no tricks to the tuning procedure, but it must be accurate, as mentioned later. In Fig. 2, the 14-Mc. tank circuit is tuned by adjusting for maximum grid current in the 6SN7GT doubler, and then the doubler plate circuit and the follower cathode circuit are tuned for maximum grid current to the 807, about 4 ma. It will be found possible to obtain a set of conditions where the follower will act as an ultraudion oscillator, but this is not the case when the cathode and grid circuits are tuned to exact resonance. If the grid circuit is tuned off to the high-frequency side or if the cathode circuit is detuned to a lower frequency, self-oscillation will probably start. However, if the grid current of the 807 falls to zero when the VFO is turned off, it indicates a stable condition of the cathode-follower stage. The final plate voltage is then turned on and the output circuit tuned for a dip in the usual manner.

For proper operation of the cathode-follower driver, observing the following precautions should keep one safely out of trouble: First, the magnetic coupling between the doubler tank and the follower tank should be held to a minimum, to avoid the possibility of oscillation in the cathode-follower stage. Small-diameter coils mounted at right angles and separated by several coil diameters will do the trick. Secondly, the final tank should be isolated from all other tuned circuits by placing it above the chassis and keeping the other circuits below the chassis. This is the usual precaution of minimizing the magnetic coupling between plate and grid circuits.

If the oscillator in Fig. 2 is to be keyed for break-in operation, several changes must be made. First, the ECO should be replaced by one that keys well, or by a crystal oscillator. Second, protective bias must be added to the doubler by using battery

(*Continued on page 112*)

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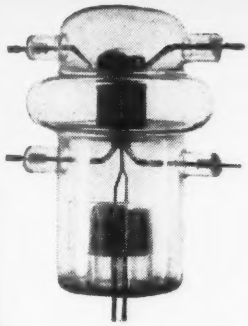

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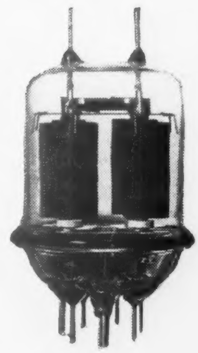

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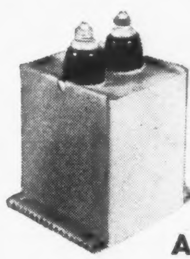

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(Continued from page 108)

bias (22½ volts). Next, the Class A cathode follower must be left running all of the time, but make sure the doubler plate and cathode-follower cathode circuits are tuned to the same frequency, as mentioned previously. A 15,000-ohm dropping resistor should be used between plate and screen of the 807, with a 20,000-ohm bleed from screen to ground. About 45 volts of fixed grid bias should be added to the 807, to limit the current under key-up conditions. This will not be enough to cut off the plate current when the key is up, but more isn't necessary because the 807 won't oscillate, no matter where you set the plate tuning!

About the Author

• You'd never expect a fellow with a shifty call like W9ECO to complain about DX, but Paul D. Frelich says the best stuff he has been able to chase down are the U.S. and Canada. Hi! ECO is an engineer in the Sonar Engineering Dept. of the Submarine Signal Co. His wartime projects included instructing at Chicago Signal Corps schools and work as a research technician at Harvard Underwater Sound Laboratory. He has attended Wright Junior College, Chicago, and the Illinois Institute of Technology. Paul is a member of the Waltham Amateur Radio Assn. and the Eastern Mass. Amateur Radio Assn.

Strays

Q) "Dear Editor, *QST*: I believe it would be greatly appreciated by all if you would get the facts and publish them about the effects on our rigs of the new bug killers, DDT and kin. They are sure to be squirted around promiscuously and who knows what damage they can do?" — *Peyton R. Randolph, W6OGJ*

A) Well, W6OGJ OM, we read in *The Boston Sunday Post* recently (tnx to *W1MD*) of the experience of Bill Renault, W1MTH, who is also an amateur seismologist of renown. Seems that one evening last summer Bill noticed a very fancy series of lines on his homemade seismograph indicating an earthquake of gigantic proportions. Since MTH felt his place in the universe was secure for the moment he puzzled the chart. Eureka! a spraying of his delicate scientific apparatus with DDT and he had restored the world's equilibrium. Of course the mosquitoes that caused the unbalance of his gear's delicate wires are no longer concerned with happenings on this planet. — *Ed.*

BCI to Philco receivers can usually be cured (if the set is otherwise normal) by the addition of a line choke in each a.c. power lead, just inside the chassis.

— *W6AM*

25 Years Ago

(*Continued from page 28*)

speeches, including one by 12-year-old Jack Colligan, the young squirt from Dallas. Prof. Jansky presented firm evidence of the superiority of c.w. over spark in his address. Traffic-handling matters were reviewed under the direction of Traffic Manager F. H. Schnell. C.w. Night was managed with better strategy than Spark Night, and as a result a c.w.-spark conflict was averted. r.f. amplification, the 1DH c.w. circuit, and antenna discussions keeping the delegates busy. Our ARRL Board of Directors held a busy meeting, during which a decision was reached to send Paul F. Godley to England for the second Transatlantics. Complete test schedules are listed in this issue. And then there was the ball game, the gigantic radio show with over 50 exhibitors, and the boat ride on the *S. S. Theodore Roosevelt*. The grand finale was the banquet at the Drake, with all guests joining in a rousing vote of thanks to the Chicago Executive Council, and then home.

There was room left in this convention issue to feature a bit of the new apparatus shown at the conventions (Portland, Maine, played host to the N. E. Convention recently). The Connecticut Detector Tube and Tuning Unit, the Grebe CR-8, the Paragon Telephone, and the Amrad Regenerator are all detailed. Stations described in this *QST* are 6OH, 3CS, and 9ZL.

Strays mentions that Dr. Lee deForest is going to Germany for a few years, away from the cares of business, to carry on special research. . . . MUU, Carnarvon, Wales, will transmit Godley's reception reports daily during the Transatlantics. . . . Try using tinfoil in back of your receiver panel, OM, to reduce hand-capacity effect.

24-Cm. Wavemeter

(*Continued from page 36*)

disk, with the nut on the underside, to the washer (J) with three 4–40 machine screws. The bolt should now turn rather easily and without binding.

Make a coil spring (Q) of music wire (about 0.050″ wire) with a one-inch free length and an inside diameter of 9/32 inch. Bend or grind the ends of the spring square, so that it stands up straight when placed on a flat surface. Slide a washer (R) over the bolt, add the spring (Q), and then fasten a regular dial to the end of the bolt. It is best to choose a fluted dial with a skirt or flange. For convenience in taking measurements it is desirable to make and label 50 lines on the skirt, spaced 7.2 degrees apart around its periphery. Each division is now 0.001 inch motion of the tuning member when using a 1/4–20 bolt. A dial with 360 degrees marked on it would also be suitable. A fair approach to this can be achieved by taking two protractors and mounting them underneath but protruding beyond the skirt of the dial.

(*Continued on page 116*)

(Continued from page 114)

The divisions on the dial together with the marks on the vertical scale mounted on the cover plate provide means for taking fairly accurate readings.

The Pick-up Antenna

It is necessary to make a simple antenna (S) that can be used to pick up signals from the transmitter. Cut a piece of the small or inner telescoping tubing (T) to a length of 5 inches. Pass a straight copper wire (U) (about No. 16) through its center using one or two polystyrene "beads" (V) to support it, making a small coaxial line. At one end of this line make a loop (W) about $\frac{1}{2}$ inch long by $\frac{1}{4}$ inch wide, and solder its end into a small saw-cut in the edge of the tubing. Shape the loop and file the solder joint smooth so that it can slide through the larger tubing and into the resonator chamber. At the other end of this coaxial line bend the wire at right angles and cut it off at $2\frac{1}{2}$ inches. Now solder another $2\frac{1}{2}$-inch piece of wire to the tubing in the other direction, thus forming a doublet or "dipole" antenna (S).

Cut another piece of this tubing $1\frac{1}{2}$ inches long (X) and make a similar loop (Y) at one end. Arrange the other end of this short coaxial section with a suitable fitting to connect to the particular type of crystal holder you have available. The holder should use the standard-type crystal cartridge (B^1) such as the 1N21 or 1N22 silicon detectors. The photograph shows a typical crystal holder (C^1) which is made to couple to a $\frac{1}{4}$-inch coaxial fitting. If a crystal holder is not on hand, it is necessary to provide some means for connecting the crystal in *series* with the center conductor of this pick-up-loop section. (Do not solder to the crystal cartridge at all!) The cartridge should be entirely shielded, and polystyrene tape or other dielectric material should be wrapped around the large end to provide a capacitance to and yet prevent it from shorting to the outer conductor. A small 500-$\mu\mu$fd. "button"-type condenser may be used as this by-pass capacitance. The indicating instrument (usually a 0-1 ma. d.c. meter) is now connected between the large end of the crystal and the outer conductor. The small or pin end of the crystal connects to the inner conductor and completes the circuit both for r.f. and d.c. through the loop to the outer conductor. It is important to remember that there must be a low-resistance d.c. return path for the crystal current via the loop circuit, otherwise the meter will not read.

Put the antenna loop (W) into one side of the resonator and the crystal detector loop (Y) into the other side. Orient the loops so that they are in line with the axis of the wavemeter and are protruding part way into the inner can. Make some simple strap clamps (A^1) from the $\frac{1}{32}$-inch sheet brass stock to go around the slotted sections of the loop guides to prevent the loops from sliding or turning after the unit has been calibrated. When the crystal and meter are connected, the wavemeter is ready for operation.

(Continued on page 118)

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(Continued from page 116)

Adjusting & Calibrating

Place the antenna in the field of a low-power 24-cm. transmitter, and slowly turn the dial of the wavemeter until a reading is obtained on the meter. If the meter goes off scale, back out or rotate the loops to reduce the coupling, and retune the resonator. Adjust the coupling until the meter reads about ½ to ¾ of full scale when placed several feet away from the transmitting antenna. Another way to reduce the coupling is to reduce the size of the loops. If the crystal is not very sensitive, a 100-μa. meter may be needed.

The job of calibration comes next. Before going into this, however, it must be pointed out that the loops cannot be moved after calibration without spoiling the dial readings, so be sure they are adjusted to your satisfaction and then clamped in place before going further. The simplest method of calibration is to obtain readings on a previously-calibrated 24-cm. wavemeter. If this is not possible, it is then necessary to take the alternative step. Make a Lecher-wire system several wavelengths long (about one meter) with two parallel copper wires spaced ¾ to 1 inch apart. Stretch them between two wooden posts or on a device like a bow. At one end connect the wires together and loosely couple this loop to the transmitter. Take a small dial lamp (2 to 6 volts, depending upon the transmitter power) with wires soldered to its terminals, and slide it along the transmission line. It will light at certain points and will go out altogether at others as it is slid along. Now loosely couple the wavemeter to the system and tune for a peak on the meter. Measure the distance (in centimeters) between two adjacent points where the bulb is extinguished, and this will be equal to *one-half* wavelength. The reading of the wavemeter dial now corresponds to the wavelength just measured. By repeating this procedure for several different wavelengths in the 24-cm. band, calibration points for the wavemeter dial can be obtained. Refer to the ARRL *Handbook* for further information on using Lecher-wire systems.

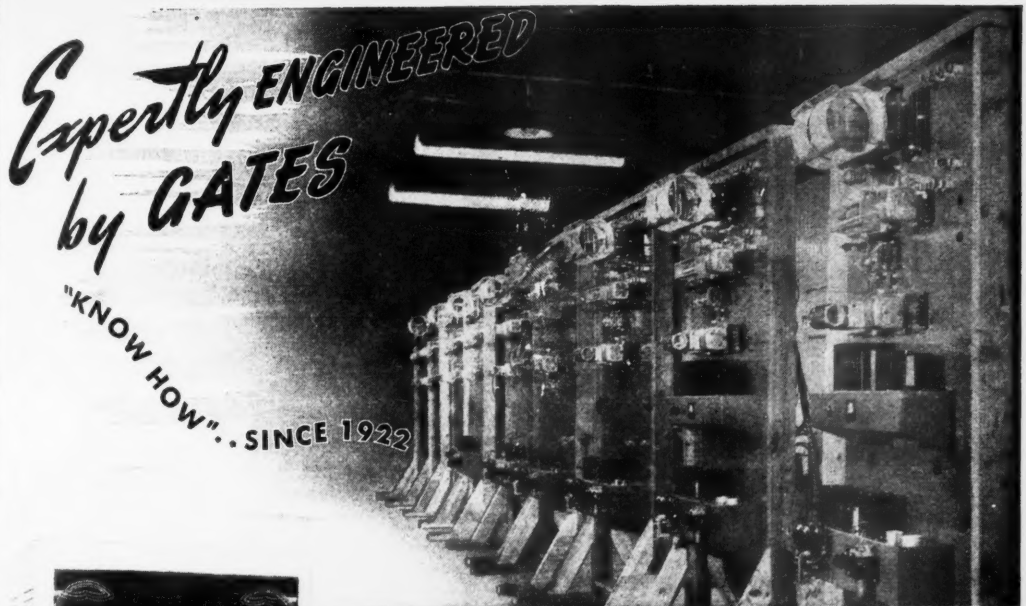
It is quite useful to plot a graph of the dial readings against wavelength (or frequency) to simplify interpolation between the calibration points. To convert from wavelength to frequency use the following formula:

$$\text{frequency in Mc.} = \frac{30{,}000}{\text{wavelength in centimeters}}$$

A typical calibration curve is shown in Fig. 4. If the dimensions of the wavemeter are followed rather closely, the slope or tuning rate of its calibration curve should be the same as the one illustrated. About five turns on the dial are required to cover the entire band of 80 Mc.

The Q of the experimental wavemeter was 850. Since Q is related to bandwidth by the following

(Concluded on page 122)



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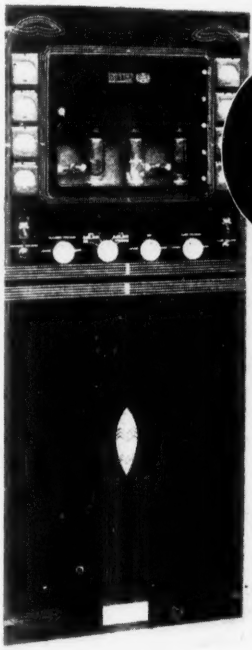

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The above unretouched photograph taken in the modern, GATES factory, shows how 250C-1 Transmitters are produced in the modern, assembly-line manner. No, GATES Transmitters are not built one at a time, though each individual Unit is engineered as if it were a custom built job.

GATES up-to-date methods in engineering are your assurance of high transmission efficiency of each Unit with the added advantage now of mass production to assure a service which will be better than ever when prevailing shortages and other restraining conditions improve.

GATES 250C-1 Transmitters—like all other GATES Broadcasting Units—are in mass production to meet the increased demand of operating Stations and of those now planned, when the time comes.

You may always look to GATES for leadership—in engineering perfection as exemplified in the GATES 250C-1, for new developments—and now modern factory methods for final production.

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EXCLUSIVE MANUFACTURERS OF RADIO TRANSMITTING EQUIPMENT . . . SINCE 1922

(Continued from page 118)

expression:

$$Q = \frac{\textit{frequency in Mc.}}{\textit{bandwidth in Mc.}}$$

the bandwidth to the half-power points of the resonance curve was 1.48 Mc. for the soup-can wavemeter. It is possible to regard the bandwidth of this type of circuit in exactly the same manner as with low-frequency resonant circuits using conventional coils and condensers.

To dress up the appearance of the wavemeter a coat of black wrinkle paint provides a durable finish. Be careful not to get any paint on the inside where it could cause poor contacts, especially in the loop guides. Again it must be mentioned that moving either the loops or the location of the dial on the shaft will affect the calibration.

In general, the wavemeter is used with the dipole antenna to measure the frequency of an oscillator or to determine an antenna pattern. A small loop section similar to that on the crystal detector can be used, however, for coupling to a coaxial line input. If this is desired, it would be well to calibrate the wavemeter with the loop in place, and then make a dipole antenna which would couple to this loop section like a coaxial line. Either the antenna or a coaxial line can then be used on the input at will, without seriously affecting the calibration.

World Above 50 Mc.

(Continued from page 54)

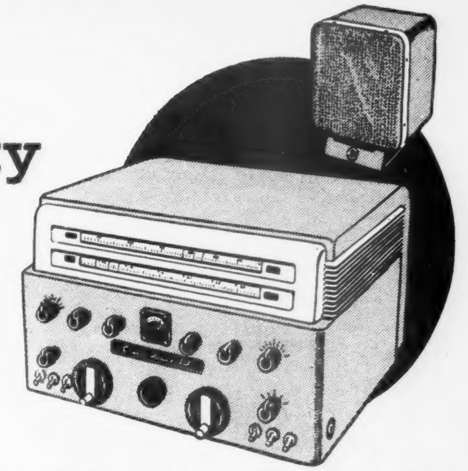
chusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland and Delaware, a total of 9! Can anyone top this?

Under the right conditions it is possible to work long distances with even flea power. W6VNI/6, operating from Grouse Ridge, 45 miles northwest of Lake Tahoe, worked W6PVT/6 at Castle Rock, near Santa Cruz, a distance of 182 miles. From Oakland, he worked W6BLP/6, 8 miles east of Lake Tahoe, a distance of 135 miles. The power: W6VNI — 0.5 watt; W6BLP — 0.86 watt; W6PVT — 7 watts! This sort of power works in the East, too. W1SS/1, Arlington, Mass., put a solid signal into West Hartford recently with a 3-watt mobile rig. W2QAN, Williston Park, L. I., has worked W3BM, Minotola, N. J., a distance of 110 miles, with a 2C44 oscillator, running 5 watts input.

The cities bordering the Great Lakes are alive with 2-meter stations, and Helen Harris (Mrs. W8UKS, Cleveland) writes that the gang have been dismayed that nothing of their activities has appeared in ***QST***. (This department is not the least bit psychic — we have to be told these things!) She lists the calls of 36 stations active around Cleveland. Since the middle of June, many of these folks have been working stations in and around Detroit, and as far north as Pontiac, 110 miles. W8UMI, Highland Park, Mich., and

(Concluded on page 126)

Receiver Sensitivity



CONSIDERABLE INTEREST has been shown recently in methods of measuring and specifying sensitivity of communications receivers. We would like to explain a system for measuring receiver sensitivity which we believe will be accepted as standard by the industry.

First we would like to point out that the term sensitivity encompasses two receiver characteristics, overall gain, and signal to noise ratio.

The sensitivity in terms of overall gain is defined as the input signal required for a given AF power output. It might be expressed as one microvolt input for 50 milliwatts output. This figure becomes meaningless when, as is frequently the case, the receiver gain is sufficient to produce the standard AF power output with no signal input, i.e., from the receiver noise alone.

The sensitivity in terms of signal to noise ratio is the most important performance figure and the one for which there is no generally accepted test. Existing methods for measuring signal to noise ratio become involved in such terms as percentage modulation, receiver band width, audio amplifier response, receiver input impedance, type of dummy antenna, standard reference conditions, methods of making test, etc. Unless all of these items are strictly specified, the results are meaningless.

During the war, a method for measuring the sensitivity of radar receivers came into general use. The method involved a comparison of the signal to noise ratio of the receiver in question with the signal to noise ratio of a perfect receiver under the same conditions. Perhaps, you wonder why the signal to noise ratio of a perfect receiver is not infinite. It would be, except for the thermal agitation noise generated in the radiation resistance of the antenna itself. Thermal agitation noise is the noise voltage generated by the movement of free electrons within any conductor. Its magnitude depends on the resistance of the conductor, the band width of the amplifier used to measure the noise, and the temperature of the conductor. Knowing these factors, its value may be readily calculated.

The resultant sensitivity is expressed as a ratio between the performance of the receiver under test and the performance of the perfect receiver. The performance of the receiver under test is limited by the actual receiver noise while that of the perfect receiver is limited by the thermal noise of the antenna radiation resistance. Since both receivers have the same signal impressed on them, the ratio of their signal to noise ratios is simply the ratio of the actual receiver noise to the thermal noise of the antenna. This figure is called the Noise Factor and is expressed as, say "10db from thermal noise."

The advantages of this method of measuring and expressing sensitivity are obvious. Here are a few:

1. The performance of the entire receiver can be expressed as a single ratio without any qualifying statements.
2. The performance of the receiver can be instantly judged because best obtainable performance figures, up to several thousand megacycles, are known. Also, the receiver is being compared with perfection so the maximum improvement which could possibly be made is always known.
3. Data from various receivers of widely different input impedance, band width, etc., can be compared directly.
4. Performance of a receiver with an entirely new band width, input circuit, etc., can be instantly judged since these factors have no appreciable bearing on the results.

This method of measuring the sensitivity, or noise factor, of a communications receiver is very simple. First the equivalent noise of the receiver is measured. This is the carrier input required to double the noise power output. In a typical case this might be 0.3 microvolt. Then the thermal noise generated in the antenna resistance is calculated. For a receiver with 5KCS band width and 300 ohm input resistance, this is 0.15 microvolt. The receiver in question then has a noise factor of 0.3 divided by 0.15 or 2. This may be expressed as "6db from thermal noise." This example happens to be the performance data taken on the Cardwell Fifty-Four.

The performance of 6db from thermal noise means several things:

1. This is about the best performance obtainable at the present state of the art over the frequency range covered by the Cardwell Fifty-Four.
2. This same performance holds for all positions of selectivity, and for all frequencies within the range.
3. It will *never* be possible to make a receiver more than 6db better than the CR-54. In order to accomplish this 6db improvement over the CR-54 it would be necessary to use noise-free vacuum tubes and have infinite input and interstage coupling resistances. These things are considered impossible at the present state of the art.

Complete technical bulletin describing the Cardwell Fifty-Four sent on request. Allen D. Cardwell Manufacturing Corporation, 97 Whiting Street, Plainville, Connecticut.

Mack C Jones

(*Continued from page 122*)

W8UKS have been running polarization tests, and have worked with horizontals where verticals appeared ineffective under similar conditions. Contacts were made with Toledo stations, as long as vertical polarization was used at both ends, but the vertically-polarized stations have not been heard since W8UKS went horizontal. They go in for antenna height out there, apparently, as W8ML is building a 150-foot tower!

A nightly test period is maintained for contacts between Toledo and Detroit. About 15 stations are active in the Toledo area, and they listen nightly for calls from Detroit between 10 and 10:15. The calling and listening are reversed between 10:15 and 10:30. W8YKF, who sends in this information, has a 16-element array, and has worked W8s YGG, GYF, VIO, UML and TSB in Detroit.

As a means of keeping the gang in the Chicago area informed of 144-Mc. doings, W9NFK is publishing and distributing the *Midwest VHF News*. Circulation is growing by leaps and bounds (in two issues) and the paper increased from one sheet to four, in the same period. Looks like Bill has taken unto himself a job! The little paper is filled with newsy stories of the doings on 2 around Chicago — a lot of the sort of stuff we'd like to run in this department, if the United States wasn't such a big country!

There are now about 25 stations active on 144 Mc. in Erie, Pa., according to W3NCJ, SCM, Western Pennsylvania. Most of these are using HY-75 rigs, and operation is normally confined to local and semilocal work. A few times conditions have permitted contacts with W8NOR, near Buffalo, a distance of nearly 100 miles. W8NOR observes that such doings are far from being a nightly affair, at the present state of the art in that area, as schedules for 8 nights in a row, after one of these sessions, resulted in no contacts whatever.

Does your antenna relay actually serve its purpose, when used with coax or 300-ohm line? W1HD reports that he had a very high standing-wave ratio on his line when it ran through the antenna relay. This cleared up, as did very troublesome broadcast interference, when the line was connected directly to the transmitter. All this points up the need for TR-box technique in v.h.f. work. Has anyone any suggestions?

Is anyone around New York City interested in promoting some work on 2400 Mc.? League-president Bailey, W1KH, has a 2C40 lighthouse rig and is looking for customers to work.

Strays

W4ILT (a newly-issued call) was a 1st Lt. during the war, W1MSG was a M. Sg., and W7ART an ART. Heard the one about the full-colonel who took his amateur examination recently while on terminal leave and passed with flying colors, only to have the FCC demote him to W-PVT? Now *you* tell one!

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HT-9 Transmitter (1500 KC to 28 MC)	250.00
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NC-2-40-C — (Speaker, $16.44 extra)	$225.00
HRO-5TA-1 — (1700 KC to 30 MC)	247.00
Speaker, $10.95; Power Supply	17.70
HRO-5RA-1 — (Rack Model)	274.35
Speaker, $19.80; Power Supply	33.00
NC-46 — (Speaker, $9.90)	97.50
1-10-A — (Power Supply $19.50)	56.10

RME

RME-45 with crystal, meter and speaker	$186.00
RME-84	98.70
DB-20 Preselector	68.20
VHF-152 (2, 6, and 10 Meter Converter)	86.60

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McElroy Model Fu-40. ECO/crystal exciter unit or 50-watt transmitter unit. Complete with foundation kit and three tuning units $27.25

Wire, write or phone your order. We will ship C.O.D. with a $5.00 deposit. We also offer easy terms and trade-in allowances for used equipment. State Tax not included in above figures.

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Navy Day Receiving Competition

To Be Held on October 27th

A message to radio amateurs from the Secretary of the Navy will be transmitted on Navy Day, October 27th. In connection with this message ARRL will conduct its eighteenth Navy Day Receiving Competition. All amateurs are invited to take part in this activity, which constitutes amateur radio's participation in the celebration of Navy Day.

Two messages will be transmitted, one from Radio Washington (NSS), the other from Radio San Francisco (NPG). These messages will be substantially the same in thought but will vary slightly in wording. A letter of appreciation from the Navy Department will be sent to *every amateur* who makes perfect copy of the text of one message. Should characters for any reason be transmitted with improper spacing such as from tape-punching errors, words containing such characters will not be counted in the grading of papers. Both messages may be copied, but only the best copy should be submitted in the competition. It is not necessary to copy both stations, and no extra credit is given for so doing. However, if both stations should be copied, please mention the fact when submitting your *best* copy so that the number of operators copying each station may be ascertained. Only the *text* (including any punctuation therein) of each message will count (not the preamble, break, signs, and the like). Copy what you hear. Do not guess! Credit will of course be deducted for logging anything that was not actually transmitted!

Mail copies for grading to the ARRL Communications Department, West Hartford, Conn. Send your original copies — recopying invites errors. An Honor Roll of letter winners and all other participants will appear in *QST*. In submitting copy please mention if you are, or have been, a member of the Naval Service.

Transmissions will be approximately 25 words per minute and will be preceded by a five-minute CQ call on the following schedule: From Washington: NSS, 9:00 P.M. EST (0200 GCT), simultaneously on 122, 4390, 9425 and 12,630 kc. From San Francisco: NPG, 7:30 P.M. PST (0330 GCT), simultaneously on 115, 4390, 9255 and 12,540 kc.

Simulated-Emergency Test

October 12th or 13th

The Community Plan. A community plan for the amateur radio service is the responsibility of each ARRL Emergency Coördinator. Many factors enter into EC Plans: Recruitment of and disposition of fixed, portable and mobile stations, establishment of 144 Mc. and lower-frequency links, contact with agencies served, alerting plans, suburban coverage, liaison with other communication services, the number of amateurs and their facilities. All these things EC's must consider. Old plans are under review; new fall plans will count you in if you will help! (ARRL bulletins, December, 1945, *QST*, and a letter of July 3rd to ECs, sets up the ARRL plan for Emergency Corps organization. This provides for community needs, for collaboration with the Red Cross, for liaison with other communications.)

The Test. On or before October first your Emergency Coordinator will have received the plan for this simulated-Emergency Test from ARRL Hq.

Part I: Your Emergency Coördinator can inform you at any time about his General Plan of emergency work . . . how the amateur service will operate, the special needs of your community, the alerting plans, how you can fit in. It is only necessary for you to sign up, tell your EC about your station and what you can do.

Part II: The EC cannot tell you *in advance* when a real emergency will develop. He can tell you whether your test will be on the 12th or 13th of October, and the alerting and general plan can be reviewed. If and when the "emergency" does develop the amateurs who have joined the ARRL Emergency Corps will be advised by the EC and will know what to do. On the 12th or 13th the EC will have Incidents, hour-to-hour developing problems, liked sealed military orders, representing progressive happenings in a real emergency. Some of these may involve changes from his prearranged plans necessary to meet unexpected contingencies. You will have to be in the AEC to be given a part, and to know about Part II.

Hams in Communities and Clubs. If you haven't an Emergency Coördinator, get one. Drop a card or letter to the SCM SEC. Recommend a "provisional" EC who can put your town on the map in this Test, and in radio doings to follow.

All Individual Amateurs. If you haven't an AEC card, get Form 7 from the EC, from the SCM, cr from us. It is the blank on which you tell about your gear and join up with AEC. Give this when filled out to the EC (or Section official when no EC has yet been designated). As soon as you are in the Emergency Corps ask for details on the general local preparatory plans so you will be familiar with them and your part.

Emergency Coördinators. If your bulletin files are incomplete advise us what you need. You should now have all needed supplies. If cards, applications or repcrt forms are low, advise ARRL promptly. Should mail go astray: SCMs SECs will have extra copies of Incidents for the October Test. Don't write or wire Section officials or Hq. for such before October first please. Best of luck in the Simulated Test. We'll be looking for your report.

— *F. E. H.*

(Continued from page 55)

fests and other places where amateurs gather in large numbers. Since I never met any such persons, I finally concluded they were just guys who liked to be "agin" anything. Let the majority of the population favor fresh air and these folks will oppose the movement on the grounds that air contains oxygen and that oxygen is a stimulant — or maybe they'll just be "agin" it on general principles. By degrees, then, I began to think the whole thing was a myth, and that there really could be no such thing as a ham who was against the League.

But I have learned lately where to find these "aginners" — the whole twelve of them! I learned how they spend their operating time, their frequencies, and their favorite pastime. They will be found on, or very close to, 3555, 7145, 14,280, 29,150 and 52,000 kc. — the frequencies used by W1AW for the ARRL Code Proficiency Program. They begin transmitting daily, Monday to Friday, at the moment W1AW begins the code practice — and they continue throughout the hour, switching to 999.9 watts during the 35 w.p.m. period. During the remaining 23 hours and on week-ends, they probably get together and exchange notes on how well they QRMed the other 60,000 lowly hams who were diligently trying to "make 15" or some higher speed.

These "aginners" are probably gainfully employed during the daytime. I can imagine what they work at: probably in a laundry, distributing pins in the shirts; or as carpenter's helpers, putting squeaks in doors and windows; or perhaps stripping threads on screws; or reading commercials in the middle of radio mystery serials. . . .

— E. J. McNiel, W9SEI

QRP

401 Dryades St., New Orleans 13, La.

Editor, *QST:*

In a recent issue, the fact was stressed that during a 'phone QSO, one station reduced power in steps until only a few watts input remained, the contact being maintained 100 per cent.

Ho, hum — you must know the final plate switch can be turned *off* and the QSO maintained; tho the quality will be somewhat impaired and it isn't particularly good for the modulator. But I'm fed up on hearing some gent with a half kw. say he's reducing power . . . "now down to three watts" . . . etc. What about that 250 watts of speech?

— Robert E. Stiener, W5AVO

MASS-PRODUCTION CONTACTS

716 N. 3rd Ave., St. Charles, Ill.

Editor, *QST:*

I heard a test by TG9 —, and think it a bum idea. He stood by and had stations call him while he tuned the band to log calling stations. He then read the list of calls, with reports. He got no acknowledgment from them.

Such a procedure clutters up the band and prevents legitimate communication between stations actually working two-way. If it became widespread, the ham bands would certainly be pretty awful. . . .

— M. A. Laverty, W9EJX